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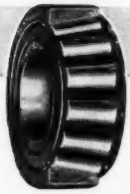

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Editorial Offices: 19 West 44th Street, New York

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Agricultural and Scientific Bureau
N. V. POTASH EXPORT MY.
of Amsterdam, Holland
Directors: J. N. HARPER G. J. CALLISTER

Each mind is press'd and open every ear,
To hear new tidings, though they no way joy us.

—Fairfax.

Better Crops with Plant Food

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Vol. XII NEW YORK, JANUARY, 1929 No. 1

Look out, says Jeff, or your resolutions will become —

Obligations

By Jeff McDermid

AFTER thinking it over as the Unknown Year opens, I am inclined to be brave and exclaim, "Much obliged for my obligations! Bring on all your old bothers and see if I care! I'll either make a betterment or a botch of 'em."

And that is the proper way to feel about it perhaps. If we take all our obligations and ourselves included too seriously and "owlishly" I am pretty sure that our better halves will have still more cause for divorce. This applies to both men and women. There is no neuter in this and no need to be neutral. Obligations should not be bogies.

But let none of my lax brethren misapprehend me and regard this as a sign to burn their ledgers for the sake of avoiding financial fretting. For my grocer informs me that there are people in our own locality who might stretch their sense of obligation a trifle to cover the human filling station as well as the auto refreshment stand. He says the reason Chinamen are so prompt with their debt settlement on New Years is that none of them ride in motors on the "deferred-payment-and-ultimate-disaster" plan. They prefer to pay for their soap and sustenance and forget the mileage instead of doing it our way.

All of which reminds me that many of our material obligations nowadays have arisen through excessive produc-

tion and powerful advertising. If I am behind in my installments on the radio, it is because somebody was away ahead on persuasion.

Production plus persuasion are the twin screws of our ship of state. The most of us pay for the coal that goes into her boiler fires. You are analyzed on the basis of mass buying power, whether you know it or not. Then your obligations increase in proportion to the size of your family and the length of your endurance. In the zeal of production and persuasion you sometimes misjudge your actual buying power and overstock your place with many mortgaged lares and penates.

But why criticize the system? Hasn't my neighbor, the collection lawyer, a right to meet *his* obligations by seeing that *you* meet *yours?*

BACK in the flush days of the nursery stock, liniment, and lightning rod salesmen, our best means of sales resistance were the pitchfork and "Old Towser." If those defenses both failed, we hollered, "Oh, Min!" She was always ready to defend her butter and egg money from those soft spoken business banditti.

Our obligations in those peaceful times consisted of salt pork, mush and milk, a feather bed, the bi-annual hair cut, six pounds of horseshoe plug, and one change of underwear. We had a surplus of food and nobody stopped to worry about it, not even George Piek or Senator McNary.

Our trouble with this extra food business came, strange to say, with our obligation to feed many times more people. This happened because the exchange value of our surplus of hog and hominy went far below our new fangled obligations. In other words, the busy boys had magnified our provincial buying power with the lens of prosperity. Old farm supply had to meet a new demand under new standards, and so both shoes pinched—and squeaked, too.

Hence the erstwhile primitive forms of sales resistance have vanished with the self-sufficing industries. The pitchfork has given way to the hay hoist, the dog has become a Shetland pony, and Ma subscribes to forty-leven persuasive periodicals. The bush league peddler has now become a mechanical demonstrator or even a "contact man." His game is more refined but no whit less devilish, and the way he can yank the yen is indeed a marvel.

As I said before, let's be resigned and resolve to be much obliged for our obligations, for we are obliged to be anyhow.

Eating and sleeping—and existing between times—used to be a rather simple affair. Science has helped us to enjoy our lives by showing us how to experience them more fully and deeply and to lengthen them as well.

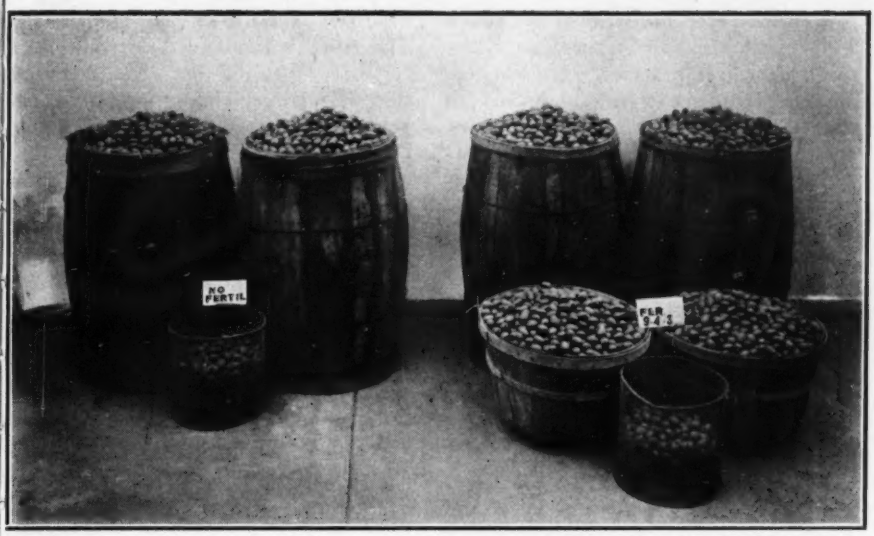
From this newer knowledge comes many of our newer obligations, and the rise in the standard of living may be an equal gain in the salvation of life.

I know, of course, that Moses and Methuselah were as long on life and whiskers as we are on vitamins and bridge whist, but I am persuaded after careful examination of the records that neither of them enjoyed the prophet business like Hank Mencken or Bernard Shaw relishes his. The higher standard of living has some compensations to offset the higher costs and penalties, as this indicates.

THUS far our rambles have been concerned only with individual obligations in the material sense. In the other field of collective or public obligations there seems more want of cautious thrift than in the balancing of family budgets.

I believe we are led into most expansive public projects by education and invention. The more educated we become, the faster we invent ways to

(*Turn to Page* 61)



Fertilizer produced an increase of about 100 pounds per acre, with a value of $40. The fertilizer applied cost $10.50.

Fertilizers *for* Pecans

By J. J. Skinner

Senior Biochemist, Bureau Chemistry and Soils, Washington, D. C.

IN this day of intensive tillage, cultivation, and fertilization of crops, the pecan has not been neglected. Methods of growing this delicious nut have kept pace with those used in the production of annual high-priced farm crops. In the beginning, that is in the early days of pecan growing, there was no cultivation and fertilization of pecan orchards. The pecan tree was looked on as a forest tree. When the young industry was started in Florida, Georgia, and Alabama but little attention and care were given to young orchards. In Texas, Louisiana, and Mississippi the pecan is a forest tree growing wild in the lowland and on stream bottoms, but always in rich moist soil well supplied with organic matter.

It required a few years' experience for the Eastern orchardist to realize that the growing of this queen of nuts was a different problem than it is farther west. The improved, thin-shell, high-bred varieties which were set require good soil, thorough cultivation, and fertilization for normal tree growth and nut production. It has been demonstrated that proper fertilization of the pecan tree is very important, and today all successful pecan growers are using commercial fertilizers.

Preceding 1918, when the Federal Department of Agriculture and some of the state experiment stations undertook a series of fertilizer experiments in commercial orchards and on Government-controlled land, only a

few of the pecan orchards in the South were fertilized, and in these no systematic fertilizer practice was followed. The experiments were conducted in the southeastern states on the principal soil types which are used for pecan growing. Various fertilizer formulas and the principal fertilizer materials were used, together with varying cultural methods and different types of green-manure crops. Hundreds of trees were involved.

Fertilize for Profit

Laboratory studies have gone hand in hand with field investigations. It was deemed as important to determine the influence of soil type and plant nutrients on the size and filling quality of the nut and the influence of these factors on the color, oil content, and keeping and eating quality of the kernel as it was to determine their effect on tree growth and nut production.

It was realized in the beginning that pecan growers would be interested in commercial fertilizers only if applications of the right materials would give sufficient increase in yield to pay all expenses and also a good profit. Even in the early years of the experiments it became apparent that best results can be expected only when the mixture applied is properly balanced and only in soils which contain a good supply of humus. The growing of summer cover crops of leguminous plants and of winter crops of legumes and of small grain is necessary in young orchards, as well as the use of commercial fertilizer. Cultivation of the soil, the growing of green-manure crops for soil improvement, and the use of commercial fertilizers go hand in hand to build up and maintain the soil's fertility and store of organic matter, both of which are required for successful pecan growing in the southeastern pecan belt.

Results of experiments conducted on several soil types in Georgia and Florida since 1918 are interesting. The work was planned to show what fertilizer formula or what combination of nitrogen, phosphoric acid, and potash gives best results on a particular soil type for pecans.

In a block of 5-year-old Succes trees on Greenville sandy loam which received no fertilizer and serves as a check, the trees gained in circumference as an average, in their fifth year, 1.5 inches; sixth, 2 inches; and seventh, 2.75 inches. The fertilized trees in the orchard gained in circumference as an average, in their fifth year, 3 inches; sixth, 3 inches; and seventh, 3.25 inches. The unfertilized trees produced no nuts in the fifth and sixth years and an average of 3 pounds per tree in the seventh year.

It is interesting to note the influence of several fertilizers of different composition on the pecans during the early years of this experiment. A fertilizer consisting of phosphoric acid and potash may be compared with one containing phosphoric acid and potash and 3 per cent of nitrogen (NH_3) and with one containing phosphoric acid, potash, and 9 per cent nitrogen (NH_3).

Bearing Trees Need Food

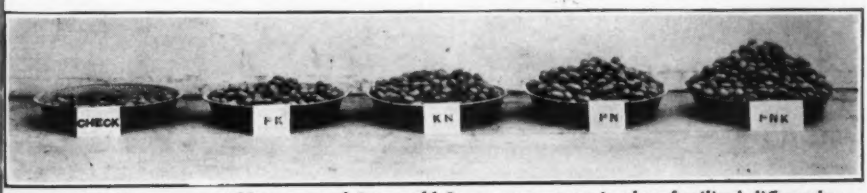
In the first year of the experiment, the tree growth was the same for each fertilizer. In the second year, however, trees receiving the no-nitrogen fertilizer gained 1.75 inches, those receiving the 3 per cent nitrogen (NH_3) fertilizer gained 2.25 inches, and those the 9 per cent nitrogen (NH_3) fertilizer 2.75 inches. In the third year, the trees receiving the no-nitrogen fertilizer gained 2.1 inches, those receiving the 3 per cent nitrogen (NH_3) fertilizer gained 3.25 inches, and those the 9 per cent nitrogen (NH_3) fertilizer 4.75 inches. All of the variously fertilized trees bore a few nuts in the first two years of the experiment. In the third year the trees receiving the no-nitrogen

The pecan orchard on the right has been fertilized regularly with a 4-8-4 mixture since the orchard was set. The section on the left has received no commercial fertilizer.

fertilizer produced an average of 3.5 pounds per tree, those receiving the 3 per cent nitrogen fertilizer produced 4.9 pounds, and those receiving the 9 per cent nitrogen (NH_3) fertilizer yielded 6.0 pounds. Since that year the relative yields from the variously fertilized trees have become even more marked and accentuated. The result is typical of that secured in other experiments on young trees on this and related soil types and has led to the conclusion that nitrogen is very important in the fertilizing of young orchards. An excess of nitrogen may cause succulent growth subject to winter injury, and for this reason a complete fertilizer is advised for use in young orchards. A mixture containing all three fertilizing constituents, nitrogen, superphosphate, and potash, analyzing at least 6 per cent nitrogen should be used.

A number of experiments indicate that the requirement of orchards 12 to 15 years old, when cover crops have been grown and plowed under from the time of setting, is for a fertilizer containing less nitrogen than is needed for trees in their early bearing period. The results secured show that complete fertilizer mixtures are required for most soils and that each constituent, nitrogen, phosphate, and potash, plays a part in tree vigor, nut production, and quality of the nut.

In an experiment on a 10-year-old orchard on Orangeburg sandy loam some very marked results, which will be of interest here, were secured. Fertilizer applications were first made in 1918 and have been continued annually since. Groups of trees were left unfertilized, and their yields have been compared with other groups which received various fertilizers differing in composition. The yield data show that fertilizers high in nitrogen have produced a larger yield over the entire period than have fertilizers high in phosphate or potash and low in nitrogen. After the fertilizer applications had continued for four years, the average yield per tree of a group of 36 trees of the Schley variety receiving complete fertilizers, but

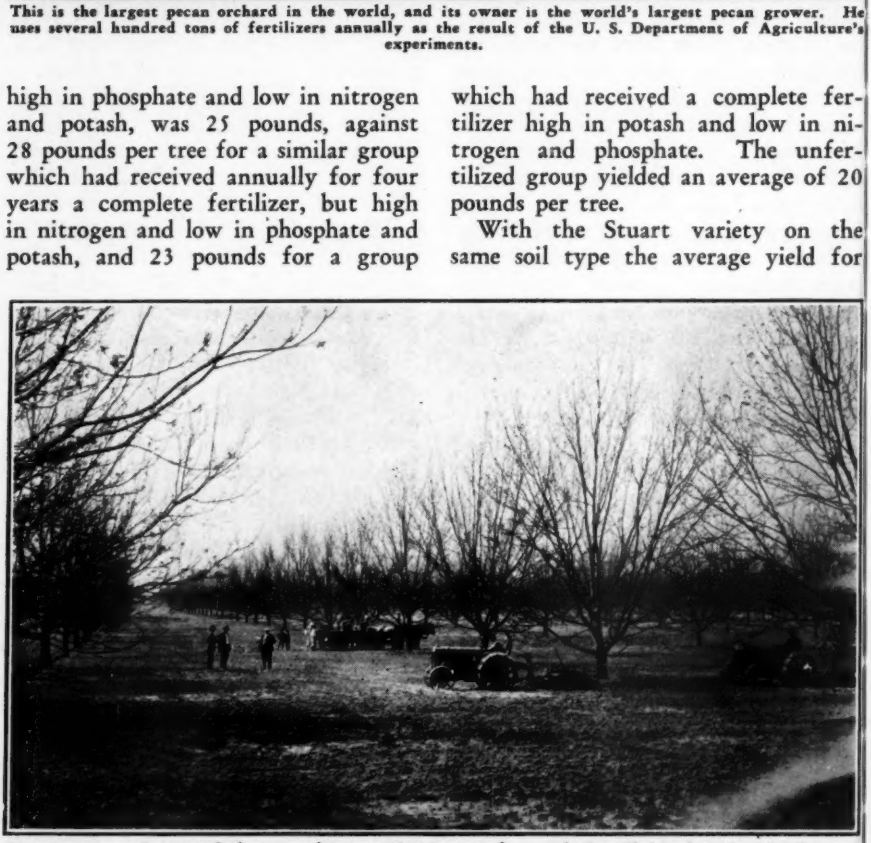


Representing the average yield per tree of 7-year-old Stuart pecan trees in plots fertilized differently on Greenville sandy loam. No fertilizer (check), 4 pounds; P-K fertilizer, 5.9 pounds; K-N fertilizer, 7.5 pounds; P-N fertilizer, 9.4 pounds; P-N-K fertilizer, 11.5 pounds.

This is the largest pecan orchard in the world, and its owner is the world's largest pecan grower. He uses several hundred tons of fertilizers annually as the result of the U. S. Department of Agriculture's experiments.

high in phosphate and low in nitrogen and potash, was 25 pounds, against 28 pounds per tree for a similar group which had received annually for four years a complete fertilizer, but high in nitrogen and low in phosphate and potash, and 23 pounds for a group which had received a complete fertilizer high in potash and low in nitrogen and phosphate. The unfertilized group yielded an average of 20 pounds per tree.

With the Stuart variety on the same soil type the average yield for



The picture at the top of the page shows a winter crop of rye which will be plowed under for soil improvement. The picture above shows the fertilizer being applied and disked in after the winter crop was plowed under.

Table 1—Effect of fertilizer on pecan tree growth on Bladen fine sandy loam.

Variety	Fertilizer	Average gain in circumference per tree in 1922	1923	1924	1925	Total
	NH_3-P_2O_5-K_2O	Inches	Inches	Inches	Inches	Inches
Curtis	9—3—3	2.57	2.69	2.88	1.92	10.00
	3—9—3	1.56	2.25	2.47	1.63	7.91
	3—3—9	1.77	2.00	1.74	2.02	7.53
	No fertilizer	2.16	1.44	2.03	1.56	7.19
Schley	9—3—3	3.50	2.12	3.28	2.28	11.18
	3—9—3	2.49	2.23	2.18	2.35	9.25
	3—3—9	2.76	2.62	1.90	1.40	8.68
	No fertilizer	1.65	1.63	2.07	1.45	6.80
Stuart	9—3—3	2.53	2.09	2.48	2.66	9.76
	3—9—3	1.53	1.03	2.41	1.69	7.26
	3—3—9	2.14	1.60	2.74	3.16	9.64
	No fertilizer	1.32	1.59	2.19	1.42	6.52

unfertilized trees was 11 pounds per tree, for the phosphate-potash group 18 pounds, for the potash-nitrogen group 25 pounds, and for the phosphate-nitrogen mixture 26 pounds.

Results secured with fertilizers on another soil type, Bladen fine sandy loam, a dark soil occurring in the lowlands and on which a number of pecan orchards are set in North Florida and in the coast section farther north, are somewhat different from those just recorded.

In this experiment, three fertilizers were used—a high nitrogen mixture, a high phosphoric acid mixture, and a high potash mixture. The orchard was 8 years old when the test was begun.

The average gain in circumference per tree and the yield per acre for four years are given in Tables 1 and 2.

It will be noted that each fertilizer produced a larger increase in tree circumference than took place in the unfertilized trees. Trees fertilized with

(*Turn to Page 59*)

Table 2.—Effect of fertilizer on yield of pecans on Bladen fine sandy loam.

Variety	Fertilizer	Yield per acre of pecans (20 trees) in pounds 1922	1923	1924	1925	Total
	NH_3-P_2O_5-K_2O					
Curtis	9—3—3	58	630	0	1105	1793
	3—9—3	61	491	0	612	1164
	3—3—9	211	486	69	1141	1907
	No fertilizer	175	328	36	770	1309
Schley	9—3—3	10	40	0	246	316
	3—9—3	14	14	0	124	161
	3—3—9	19	19	0	582	644
	No fertilizer	21	21	0	169	206
Stuart	9—3—3	48	49	5	231	333
	3—9—3	5	13	0	238	256
	3—3—9	147	56	12	273	488
	No fertilizer	57	10	2	242	311

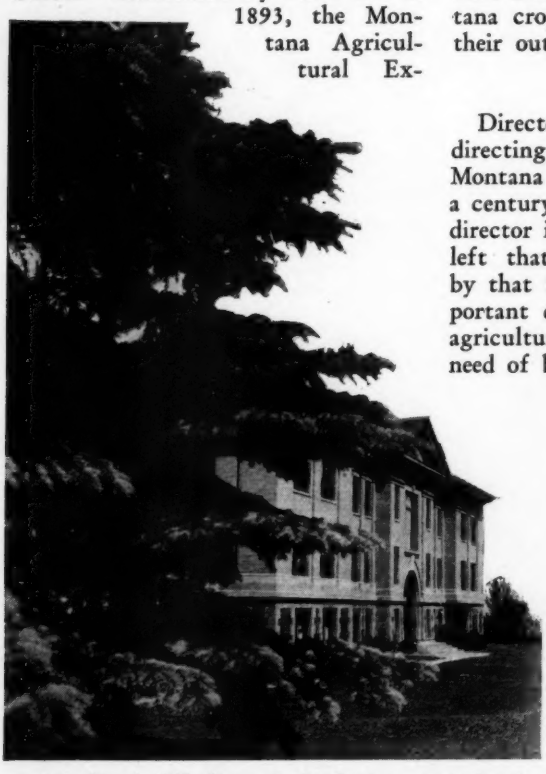
MONTANA

Experiment Station

By R. B. Bowden

Editor, Montana State College

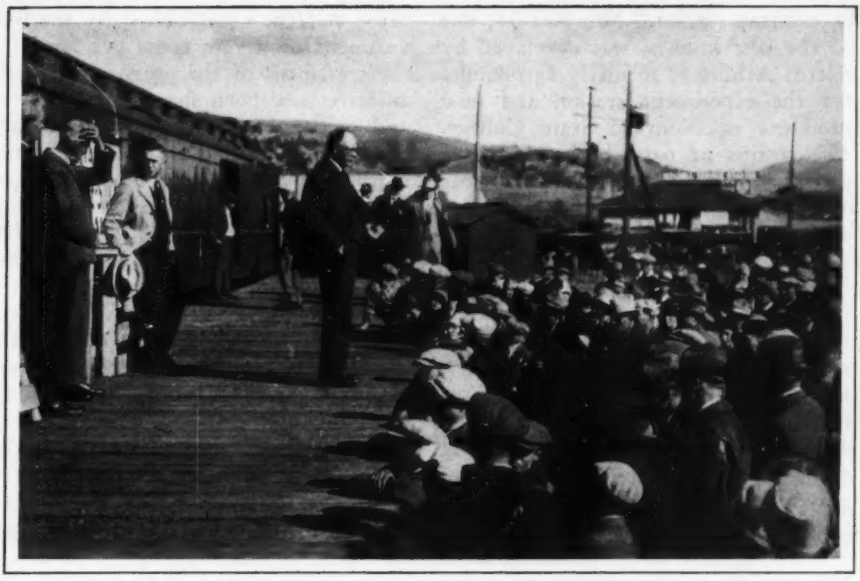
THE Montana Agricultural Experiment Station, judged from the age standard of eastern stations, is still a young organization in a young state, but from the standpoint of Montana history it is a veteran institution that has grown up and kept pace with the agricultural development of this third largest state of the Union. Established by state act in 1893, the Montana Agricultural Experiment Station functioned during the last years of the old "cow country" days, saw cattle ranging flourish and then wane to give place to sheepmen and the "nesters" and "honyokers" of the homesteading period, directed a way through the great period of transformation from 1910 to 1921, and now still holds its important leadership in a day when Montana crops are nationally known for their outstanding qualities.



Agricultural Hall, home of the Montana Agricultural Experiment Station.

Broad Vision

Director F. B. Linfield has been directing the investigational work in Montana agriculture for a quarter of a century, becoming the third station director in 1903 when Samuel Fortier left that institution. Mr. Linfield, by that fact, has been the most important directing force in Montana's agriculture and a man who has had need of broad vision to keep the station's work ahead of the swift changing agriculture in Montana. When he first took over the charge of this work, Montana still was "cattle country," although sheepmen were contesting with the "cattle barons" over the use of the range. From 1907 to 1916 came the great wave of homesteaders, who forever broke up the old free ranges and who fenced and ploughed the dry land areas of the



Director F. B. Linfield of the Montana Agricultural Experiment Station addressing a group of farmers during a tour of a special livestock train through the southern section of the state.

northern Great Plains section. Cattle ranging on a broad scale died out practically by 1912, although for a decade later there was hope among stockmen that the ploughed land would revert to range sooner or later as the homesteaders found they could not farm it successfully.

How nearly the hope of the stockmen was borne out is shown in the story of dry land distress from 1917 to 1922, when the state experienced five years of unprecedented drouth. But the ploughed land did not revert to native range, and the struggling homesteaders somehow adapted their methods and practices, with the help of this same experiment station, to emerge from those bad years into an era of average weather and good crops at good profits. Today Montana has been rated for more than a year as one of the clearest spots on the American economic map.

Director Linfield and his associates in Montana early recognized the advantages and disadvantages in the state. Distance from markets, lack of long-time information about soil and climate, variable seasons, and absolute necessity of developing an entirely new "Montana system of agriculture" were all vexatious problems. But the climate and soil were capable of producing crops of unusual quality, commanding market premiums. "Produce quality stuff" was the cry of the experiment station, and today Montana has adopted that idea as the central theme of its agriculture. Montana certified potato seed brings a premium in southern markets; Montana McIntosh apples bring a premium over all other apples on the New York market; Montana's spring wheat shows a higher proportion of premium commanding protein than the wheat from any other state; Montana cattle can hold their own with the best on the Midwestern markets. And so it holds with many other crops. Montana has learned to produce crops which, by reason of their quality, can command a premium to offset the higher freight rates.

Practically every strain of wheat grown successfully in Montana has been developed and improved at the

experiment station. Montana-36, one of the best known, was developed by Alfred Atkinson, formerly agronomist for the experiment station and now president of Montana State College. The strains of oats, barley, and rye used generally throughout the state are strains first tested and later recommended by the experiment station.

A Long-time Program

There have been more than a few spectacular developments in this rather prosaic work of agricultural investigation. It was the Montana station that developed the sunflower as an important silage crop, sunflower silage being now widely used and compared, by many feeders, with corn silage in quality. When the Montana stockmen were discouraged by the prevalence of a disease that cost them hundreds of thousands of dollars annually—the disease of goitre in new born animals—it was Dr. Howard Welch, an experiment station veterinarian, who worked out the cause and the cure. Now by the investment of a few cents per head in the treatment of the pregnant mother animals, new born sheep, pigs, calves, and colts are entirely free from this disease. In the control of insect pests, in the problem of poisonous weeds on the ranges, summer fallowing, and many other matters the agricultural experiment station has given valuable service to Montana.

State college, experiment station, and extension service have cooperated closely in Montana in the recent building of a long-time agricultural program for the state. This new program for Montana's agriculture is based upon the findings of the experiment station, combined with the experiences of extension workers and the farmers and stockmen of all sections of the state. With this definite program before them, all agencies of the state are cooperating in one of the most concentrated jobs of state agricultural development that the coun-

(*Turn to Page 53*)

Staff members of the Montana Agricultural Experiment Station: (Left to right) top row—W. E. Joseph, animal husbandry; Sherman Johnson, agricultural economics; John Lewis, grain laboratory; LeRoy Powers, agronomy; J. E. Norton, agronomy; Barbour Herrington, chemistry; Louis Vinke, animal husbandry; William DeYoung, agronomy; Edwin Jungherr, veterinary science; V. D. Young, agricultural engineering; second row—C. C. Starring, horticulture; William Hay, grain laboratory; Ralph Kenck, agricultural engineering; Leonard Gieseker, soils; Elwood Morris, botany and bacteriology; J. W. Barger,, agricultural economics; William Cook, entomology; Paul Young, botany and bacteriology; Miss Erlene Jacobs, home economics; Jesse Green, chemistry; Arthur Post, agronomy; bottom row—J. R. Parker, entomology; Edmund Burke, chemistry; Clyde McKee, agronomy; Howard Welch, veterinary science; M. L. Wilson, agricultural economics; Director F. B. Linfield; H. W. Vaughan, animal husbandry; F. M. Harrington, horticulture; Jessie Richardson, home economics; H. E. Murdock, agricultural engineering.

¶ It pays, even in poor years, to—

Fertilize Potatoes

By C. A. LeClair

St. Louis, Missouri

THE worth of any product or method can best be tested when the system employed is subjected to adverse as well as favorable conditions. It is then that the effect of unfavorable influences can be most accurately observed. During the past season the potato industry found itself in extremely trying circumstances, for everything that could possibly happen to discourage the growers prevailed.

To begin with an abnormally large acreage was planted throughout the United States. One might conclude that this was entirely due to a lack of foresight on the part of the legitimate growers. Such was not wholly the case, however, for although many bona fide potato growers planted more than their usual acreage of potatoes last spring, those who in reality had no business to be growing the crop were largely responsible for the 1928 debacle. Having observed the good prices potatoes commanded in 1926 and 1927, many plunged into the business of potato growing in 1928 in an unprecedented manner on rented acreage. Their aim was to get rich outside of their legitimate profession only to pay dearly for the experience to the ultimate advantage of the industry for several years to come, at least.

Circumstances like this have occurred before and always with the same disastrous effect on the prosperity of the legitimate grower. In some years, when fools rushed in where even wise men hesitated to plant, the growing season conditions were such as to counteract more or less the effect of an abnormally large acreage. However, in 1928, potatoes grew exceptionally well from Oklahoma to Florida and Maine to North Dakota. This resulted in the harvest of one of the biggest crops of potatoes on record with returns to the average producer in inverse ratio. If there ever was a year, therefore, when the practicability of employing commercial fertilizers and investing in spray materials could be measured it was in 1928.

Reduces Production Costs

More up-to-the-minute application of the latest scientific agricultural discoveries is practised by farmers in growing America's potato crop than perhaps on any other staple crop. The successful potato grower of today is a high type of specialist. He is able to detect and knows how to combat the many complex diseases and insect pests which attack the potato through the employment of treatments that have been thoroughly tested. The size of seed pieces and the best distance to separate them in the hills for maximum production have likewise been determined. Each year new economies in the cost of raising potatoes are being practiced.

Consequently, wherever potatoes are

extensively grown in humid sections of this country, commercial fertilizers are generously used. Through application of as high as a ton and more to the acre of a complete fertilizer, yields are today obtained which would not be believed possible 10 years ago. As a result, harvests of 500 bushels to the acre are not infrequent, and as many as 800 to 1,000 bushels have been produced on a single acre.

"Because year in and year out our aim must be to grow the largest yield economically possible, if we are to be assured of maximum returns for our labors in good years and bad, it becomes necessary to employ commercial fertilizer in growing potatoes," is the unqualified statement made by one of the most extensive and prominent growers of the country. He has demonstrated this theory to his own satisfaction and it is the plan followed by the most intelligent growers everywhere.

The Reason

Let's consider the reason why! It is true that those who follow scientific methods of production materially help to increase the total surplus in seasons of plenty and thus proportionately contribute to a minimizing of the average market price of the commodity. Yet, the apparent unfavorable effect of a surplus crop operates more in a general way than specifically. Quality products always demand more or less of a premium over the going market price. The premium paid for quality potatoes over the average run is greater in seasons of plenty. Thus, when big crops reduce the bushel price offered, the farmer who has invested in commercial plant food to insure a big yield, not only tends to increase proportionately his returns by being able to harvest more bushels; but because of the better quality which is always associated with big yields, he enhances his income through the top price his superior product demands.

To illustrate how these factors work, a farmer in Marinette county, Wisconsin, who applied 500 pounds of commercial fertilizer to the acre to produce his 1928 potatoes and who invested heavily in spray materials to prevent disease and insect injury to the crop, was able to market his potatoes at double the prevailing price at harvest time. He risked an investment amounting to approximately $80 per acre in fertilizer, spray materials, seed, and labor to accomplish this result; but it paid big. His yield was 200 bushels of sound No. 1 potatoes more to the acre than were harvested by his neighbors, who failed to apply fertilizer or adequately spray their crops. This farmer received in addition, the advantage of a premium of 32c a bushel for his tubers. His total yield per acre was 350 bushels. On the basis of the top price he received for his entire crop, his returns show that although it cost him $80 per acre to grow the crop, the net profit was at the rate of about $95 per acre.

A majority of the other farmers in the same county who did not adequately fertilize their potatoes or carefully spray them, got yields around 150 bushels to the acre at a production cost of about $40 per acre. Their gross returns were around $30 an acre and they consequently suffered a loss at the rate of $10 an acre for this season's work.

Between these two types of potato growers, there are those who practise only half-way measures. For instance, they start out with good intentions by carefully selecting their seed stock, they plant on well prepared and adequately fertilized soil, then in mid-season reports begin to be broadcast that a big crop is in prospect and potatoes are going to be cheap. They then lose heart, become negligent in their late cultivations, and perhaps dispense with late spraying entirely. The result is that although their initial investment in commercial fertilizer provides a yield which avoids actual loss

Potatoes grow rapidly when properly nourished. Note the spindly foliage of the center row which was grown without fertilizer as compared to the healthy vines at the right which received 500 pounds of complete fertilizer to the acre.

for the effort, the subsequent neglect of the crop prevents it from yielding any measure of profit.

Typical of this is the story of a grower in Minnesota. He planted 90 acres of potatoes in a most thorough manner last spring. Soon the bumper crop news began to spread. He got cold feet and decided to cut down the cost of maturing his crop after it was evident that prices were going to be low. He discontinued late Bordeau spraying on about half his acreage with the result that the late blight ravished the crop on that part of the field. At harvest he dug and field pitted his potatoes and when the pits were opened for shipment of the stock, the shrinkage from rot was as much as 50 per cent in the case of the tubers which had not been properly sprayed. His investment in commercial fertilizer gave him a big enough yield, despite the shrinkage caused by late blight owing to discontinuance of his spraying program, to just about break even and he thus avoided the loss incurred by some of his neighbors who neither fertilized nor sprayed their crop. However, failure to invest in late spray protection prevented him from making a possible profit. A few figures may help to illustrate this man's typical mistake.

Seed, labor, and other costs—$35. Yield 100 bushels at 20c per bushel, $20 returns. Loss, $15 per acre.

Seed, labor, *fertilizer,* and other costs—$45. Yield 360 bushels at 20c per bushel with blight shrinkage 30 per cent, making marketable yield 250 bushels at 20c per bushel, $50 return, or $5 per acre profit.

Seed, labor, *fertilizer, spray materials,* and other costs—$55. Yield 360 bushels at 20c per bushel, $72 return, or a profit of $17 per acre.

More Proof

However, startling as the above figures are, the actual conditions the respective growers face actually increase the difference of their loss or profit over the figures indicated above. This is because the unfertilized or neglected crop incurs extra grading expense while the quality crop pays for this and more by demanding a premium. It is the poor quality stuff dumped on the market that depresses demand and lowers price.

Warehouse after warehouse in the great potato buying sections of the country was empty at digging time

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New type of cotton picker for use in the eastern part of the Cotton Belt.

Agriculture Today

III. Plant Industry

By Frank George

NUMEROUS agricultural surveys have shown that farmers who make their business profitable are usually those who obtain large yields per acre. These farmers have solved the problem of low production costs through increased efficiency in the use of modern machinery, fertilizers, better seed, more productive varieties, and effective combat against plant insects and diseases.

Plant insects and disease, it is estimated, take an annual toll of more than one and one-half billions of dollars of crops. The wheat crop alone, declares Dr. W. A. Taylor, chief of the Bureau of Plant Industry, is probably reduced by some 97,000,000 bushels a year, on account of diseases such as rusts, smuts, scab, root rots, and others; the potato crop is reduced a similar quantity by blights, rots, scab, and virus diseases. The apple crop is cut an average of 32,000,000 bushels a year by diseases like scab, bitter rot, blotch, cedar rust, blight, black rot, and various cankers, leaf spots, and root troubles.

To be sure, agriculture always will be burdened with the cost of combat-

ing insects and disease, and that cost will be a large item in the total cost of crop production. The reduction of that cost, however, can be secured by the use of efficient control measures as part of a general program of improvement of cultural practices. The improvement of cultural practices in its widest sense, Dr. Taylor says, includes the breeding and adaptation of varieties for different regions as well as more efficient and economical cultural practices, and is particularly important in the case of such plants as fruits and vegetables, tobacco, cotton and other fiber plants, and cereals.

Major Activities

Three major activities of the Bureau of Plant Industry to meet present day production problems, cited by Dr. Taylor, include the identification of plant diseases and development of methods of control, improvement of cultural practices for more efficient crop production, and the establishment of new crops by introduction, breeding, and selection.

The first of these problems is being attacked by trained plant pathologists, mycologists, and bacteriologists at Washington and at field stations. These scientists demonstrated recently that "western yellow blight," which often destroys whole crops of tomatoes in some of the western states, is caused by the virus which is responsible for curly top of sugar beets, and transferred from plant to plant by the leaf hopper, *Eulettix tenella.* Enlightened by this new information, the prospect of securing a control measure for this disease which has baffled pathologists for a quarter of a century is much nearer at hand.

Recent experiments have demonstrated that a large amount of neck rot of onions can be prevented if the bulbs are artificially dried within two or three weeks after harvest, and some of the important onion set sections are beginning to use artificial drying as a standard crop-handling practice. Similarly, it has been shown that oiled wrappers and shredded oiled paper in packages of apples may be used to control apple scald. It is generally estimated that shredded paper adds 20 to 25 cents a barrel to the cost of packing apples, but the increased returns may be anywhere from 50 cents to $3 a barrel.

There are many examples of control by the development of resistant varieties. Of most recent date is the work in connection with brown blight, a new disease of lettuce, which has appeared in the Imperial Valley of California and in several localities in Arizona. Dr. Taylor estimates that probably the average loss in the Imperial Valley the last four years has been somewhere between one and five per cent of the crop, and he says that the best lettuce land is rapidly becoming infested beyond the possibility of growing satisfactory crops.

The disease is caused by a soil organism which has not yet been identified. Plants that are attacked when small become stunted, show yellowish

Washing fruits to remove poison residues is now extensively practised.

Applying dust in a Georgia pecan orchard during scab control experiments.

and brownish discoloration, and often die. Attacked after maturity, the outer leaves of the plants show irregular dry, dead, brown scars and blotches. Selection and breeding work by bureau representatives in California has resulted in the development of several good commercial strains of the New York and Iceberg variety, two of which strains seem to be immune. Several hundred acres of the resistant seed were planted in 1927, and the strains give promise of relief to the lettuce growers of the Imperial Valley from a situation which threatened to wipe out their industry.

Among current improved cultural practices worked out by the Government scientists is the use of the furrow drill for sowing wheat in parts of the west, especially in Montana, and winter oats in the South. This practice holds drifting snow and drifting soil, with the advantages of providing more snow cover and additional moisture in the dry-land area where snow usually blows off the fields into ravines and valleys, and prevents injury to young plants by blowing soil, which either may cut them off or partly bury them.

Better cultural practices in plowing for summer fallow and in the tilling of summer fallow in the West are being developed in cooperation with State extension services. It is shown that early spring plowing of stubble for summer fallow increases subsequent wheat yields, as compared with late spring or early summer plowing. More effective types of tillage implements for summer fallow have cut the cost of maintenance and decreased the weed crop and moisture loss. Similarly, early seeding of flax not formerly practiced and believed by many farmers to be injurious has been shown to increase yields and prevent heat canker.

Flax production in the United States is much below national needs. The bureau is recommending the growing of flax in a mixture with wheat as a means of increasing flax production in humid areas, and also of increasing crop diversification. This practice is inducing some farmers to grow flax, who otherwise probably would not produce it.

Another activity is the development of improved methods of rice culture to make it possible for California growers to control the very troublesome and injurious water weeds which have been reducing yields and threatening the whole rice industry in that State. The principal control practice is deep submergence at time of seeding. Investigations regarding "straighthead" in the Gulf States rice fields have shown this condition to be caused by unfavorable soil factors, and that if discovered in time the trouble can be controlled by draining and drying the rice fields for two or three weeks, and then applying water.

Search for Economy

The bureau's investigations support the general evidence that under many conditions production costs in connection with small grains and grain sorghums, as well as for soybeans and other crops, may be lowered by the use of the combine. These investigations

show that the average harvesting loss with combines is 2.6 per cent of the total yield as compared with 3.3 per cent for a header, and 6.1 per cent for a binder. The actual loss of grain cut with the combine averages 32 pounds per acre, as compared with 40 pounds with the header, and 74 pounds with the binder. The average threshing loss with combines is 1.9 per cent of the grain threshed, as compared with 1.2 per cent for the stationary thresher.

The steadily increasing consumer demand for new food products and the need for economy in crop production costs are emphasizing the search for new crops by both the plant explorer and the plant breeder. The most striking phase in this work is in the field of breeding for disease resistance. Some of the serious diseases of melons, cotton, cowpeas, tomatoes, and a number of plants grown under glass have been overcome by breeding resistant varieties, and this line of work has now become more or less a feature in a number of branches of the Bureau of Plant Industry. Extensive breeding work is also being carried on in connection with cereals, especially in an effort to secure disease-resistant and especially rust-resistant varieties of wheat and other grains.

Two outstanding examples of crop breeding deal with citrus improvement by bud selection in California and with improved cotton production in the southeastern portion of the United States. The California citrus bud selection work has resulted in revolutionary changes in the industry of that state and in other states and in other countries where citrus is grown. Production has been increased and non-productive and non-paying citrus trees have been eliminated.

A number of superior varieties of cotton have been produced as a result of cotton breeding, the Acala cotton, a fine upland variety, being an example of introduction and selection work combined. The Acala cotton is proving a valuable variety for California and the Imperial Valley district

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A potato digger operated with a gasoline engine.

LIMING SOUR SOILS

I. *The Value of the Different Forms of Lime*

By J. W. White

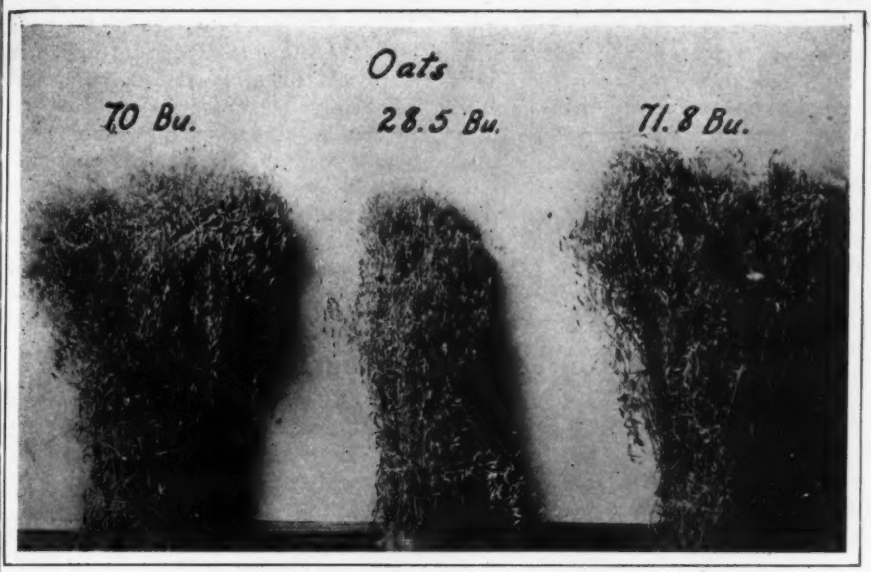
Soils Research Chemist, Pennsylvania State College

A NEW church was nearing completion on a lot just back of my home in the Old North State. Preparations were being made to apply the finishing coat of plaster. A hole about eight feet in diameter and five feet deep had been filled to the level of the ground with lime paste or cream of lime. Returning from the post-office rather hurriedly one summer day, for my girl was waiting for me around the corner, I took a short cut across the church lot and walked into this pit of lime paste and sank to the base of my three-inch collar. I thus got a baptism in lime and became more intimately associated with it even at an early age than any one of my generation.

A few years later I found myself a member of the Experiment Station Staff at Penn State, in a land abounding in sour soils, and at the same time the greatest limestone producing state in the Union. The abundance of limestone in this section is illustrated from the fact that my house and a stone retaining wall 350 feet long and four feet high were made from high grade limestone secured from the excavation. My baptism in cream of lime and later my permanent house constructed of limestone leave no avenue of escape from more or less constant thought concerning the properties and value of lime as an important step toward permanent agriculture.

Heavy yields of Kentucky blue grass produced with complete fertilizers and agricultural slag.

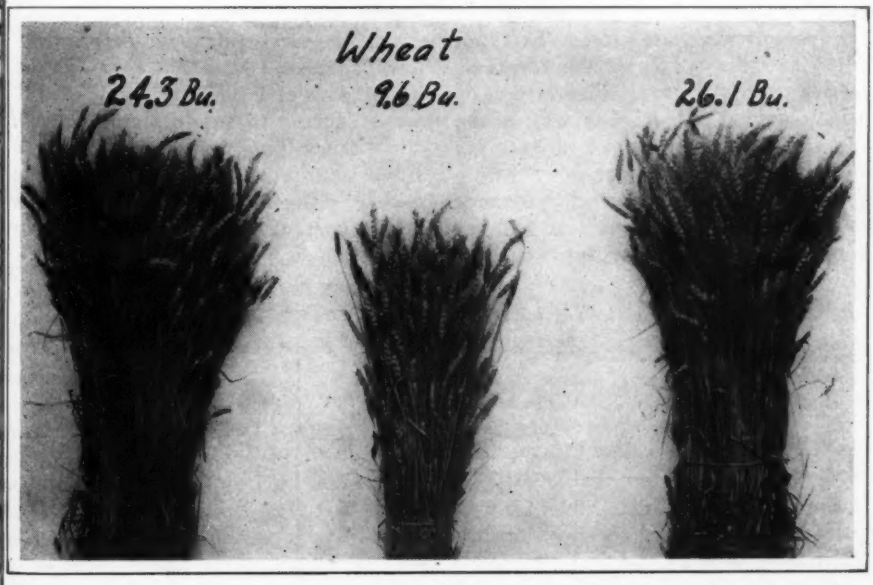
My early associations with the late William Frear, Thomas F. Hunt and also Alva Agee served to further stimulate my interest in lime and led to a study of the sour soils of the Keystone State and eventually to the establishment of a series of field plot experiments, in-



Value of lime in the production of oats, on DeKalb soil. Left to right—hydrated lime, no lime, and pulverized limestone.

cluding 279 plots designed to study the value of different forms and amounts of lime in relation to economic crop production.

As a result of these field plot studies, together with a detailed lime requirement survey, it was concluded that there is no one soil condition more prevalent in the humid region and possibly none that has a greater control-



Value of lime in the production of wheat on DeKalb soil. Left to right—hydrated lime, no lime, and pulverized limestone.

ling influence on the growth of crop-producing plants than soil acidity. This undesirable soil condition is a complex one involving many factors which tend to arrest the normal functions of the soil. The presence of toxic substances, both organic and inorganic, the absence of basic lime, and decreased availability of essential plant food constituents, no doubt, all play a part in bringing about conditions unfavorable to the best development of the chemical, physical, and biological properties of the soil. It has been shown conclusively that when some form of basic lime is applied in sufficient quantity to these sour soils the undesirable properties disappear and the soil will again become productive under proper management.

Prior to 1911, the major portion of lime sold by American producers for agricultural use consisted of burnt and hydrated lime. Since that time the trend has been toward the use of pulverized limestone to the exclusion of the more concentrated forms. Thus in 1911, 770,954 tons of burnt lime, hydrated lime, and pulverized limestone were sold by producers for agricultural use, of which 77 per cent was in the more concentrated form. In 1926, 2,147,610 tons of the three forms of lime were sold for agricultural use, of which only 13.9 per cent was in the more concentrated form and 86.1 per cent pulverized limestone.

Between these two periods the sale of limestone showed a gain of 962 per cent and the other two forms of lime a loss of 50 per cent. In 1926 a total of 2,214,674 tons of agricultural lime were sold by producers including the following percentages of different forms: burnt lime 5.9, hydrated 8.3, oyster shells 0.5, marl 2.5, and pulverized limestone 82.6. This tonnage of agricultural lime does not represent the total amount actually used for soil improvement, for a large tonnage of limestone road screenings is used, also considerable agricultural lime is sold by small unlicensed producers including by-product lime.

The keen competition in the sale of agricultural lime is shown by the fact that in Pennsylvania 102 firms are licensed for the sale of 177 brands of agricultural lime products. Agricultural lime is largely a by-product from industrial plants. Farmers of the Keystone State are using the following 10 different lime products: pulverized limestone, oyster shells, precipitated lime carbonate (by-products from chemical plants), marl, hydrated lime (high and low magnesia), burnt lump lime, ground burnt lime, blast furnace slag ("agricultural slag"), gypsum, and waste lime from tanneries, gas plants, etc.

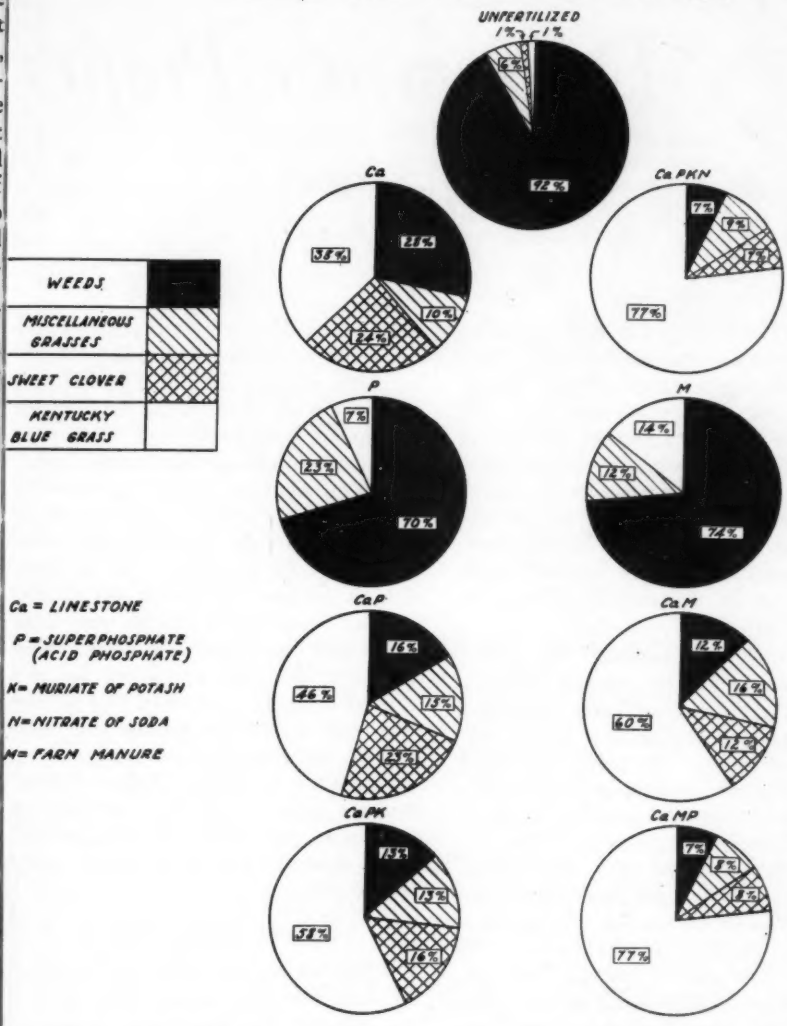
The Pennsylvania lime experiments have furnished valuable data on the importance of liming and value of different forms in production of grain and hay. The following summary based on the average results of three widely different soils serves to show the importance of lime on eastern soils.

AVERAGE ANNUAL YIELDS PER ACRE—AVERAGE THREE SOILS

	Clover and Timothy Hay	*Corn Bu.*	*Oats Bu.*	*Wheat Bu.*	*Roughage Pounds*	*Field Weight Crops*
No Lime	*1805	20.3	28.2	10.4	1399	2274
Limestone	3867	49.3	46.1	23.2	2561	4491
Hydrated Lime	3720	50.4	48.5	24.2	2603	4535
**Ground Burnt Lime	3793	49.5	37.5	23.3	2425	4281

*Weeds. **Average of two soils.

AVERAGE BOTANICAL COMPOSITION OF PASTURE VEGETATION AS INFLUENCED BY FERTILIZERS, LIME AND MANURE.
BRADFORD COUNTY – VOLUSIA SOIL – 1918-1927



This chart shows graphically the value of the several treatments in the development of permanent Kentucky blue grass pasture on Volusia soil. Compared with the check, or unfertilized land, lime has reduced the proportion of weeds from 92 to 28 per cent. Lime used with superphosphate has decreased the weeds from 70 to 16 per cent and when used with manure from 74 to 12 per cent. Complete fertilizers and the reinforced manure treatment with lime have produced a pasture which is practically free from weeds, containing 93 per cent pasture grasses and legumes.

In the lime experiment the three forms of lime are applied on the basis of equal units of lime oxides in amounts sufficient to correct the initial lime requirement of the soil. All plots are uniformly supplied with the same amount of fertilizers, so lime becomes the limiting factor. The above results show that there is no significant dif-

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Crops Determine Dairymen's Profits

By H. W. Gregory

Chief of Dairy Husbandry, Purdue University

DAVIES COUNTY, Indiana, is located in the southwestern part of the state. A large portion of the soil in this county is acid and will not grow alfalfa, sweet or red clover successfully without being limed. This, however, should not prevent the dairymen in this county from feeding legume hay to their dairy herds. Soybeans and cow-peas are legume crops, which can be successfully grown on an acid soil.

In order to determine the actual conditions in Davies county, Indiana, as to the production and condition under which dairying was being conducted, a survey was made last April by the Purdue Agricultural Extension Department in cooperation with a large number of farmers and other local people interested in agriculture in this county. Data were collected from 227 different farms, in the county. Only 36 per cent of the farms, with at least five cows surveyed, had sufficient legume hay raised on the farm to provide feed for the dairy herd during the year. On those farms where all the hay fed to the cows was either alfalfa, clover, soybean, or cowpea hay, the average milk receipts per cow were $101.00 for the year. On those farms where the cows were only fed part legume and timothy, redtop, straw, or corn fodder, the milk receipts were $69.00 per year. On those farms where no legume hay was fed, the milk receipts were $54.00 per cow for the year.

Many of the farmers in the county failed to recognize the value of feeding high protein feeds. The farmers in the survey who were buying an average of 789 pounds of high protein feed, such as cottonseed meal, linseed oil meal, or mixed high protein dairy feeds, per cow for the year, were receiving at least $150.00 per cow from the milk receipts. The amount of high protein feed purchased by the farmers receiving $150.00 per cow from milk receipts, was just three times the amount purchased by the farmers who received only $90.00 per cow from milk receipts, for the year.

There were 36 farmers with five or more cows who did not feed any concentrate with a protein content as high as 15 per cent. These farmers' milk receipts per cow were only $40.00 per year.

Affects Production

While we cannot definitely say that the feed was the entire cause of the low returns per cow, for a farmer that is giving considerable thought to proper methods of feeding and to supplying the right kind of feed is not likely to overlook the fact that there is considerable difference in the ability of cows to produce, there is no question but what the proper kind of feed was a big factor in the returns per cow found in the Davies county survey.

A very similar difference was found

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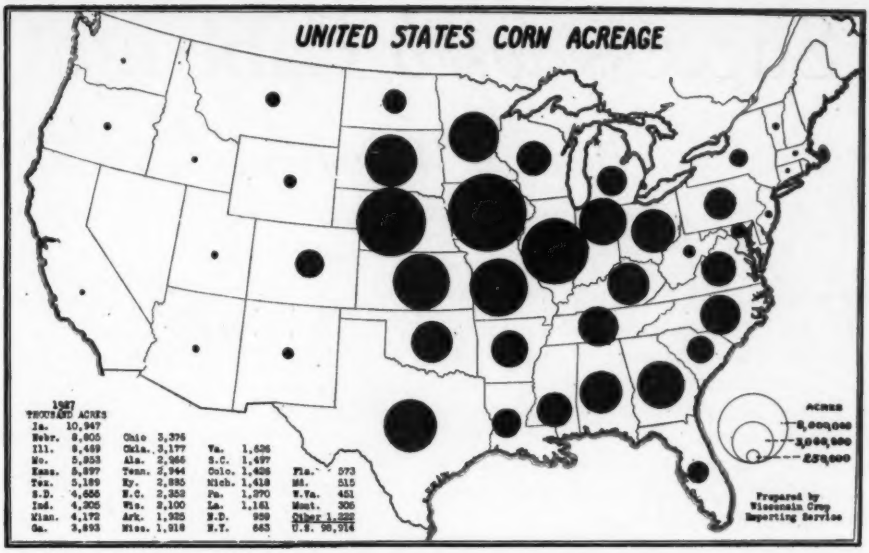


CORN

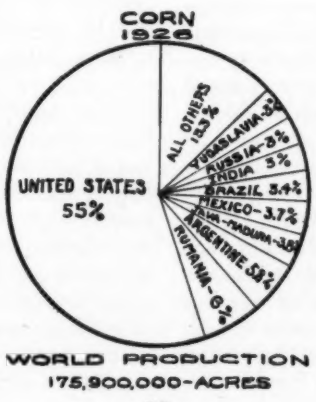
¶ *Second of a new series on crop statistics*

By Walter H. Ebling

Agricultural Statistician, Wisconsin

CORN is a grain of American origin, and about 55 per cent of the 1926 acreage was grown in the United States. It is the most important crop in the United States, and nearly 23 per cent of the crop acreage is devoted to it. It thrives best in regions having a warm and moist summer climate with warm nights as well as warm days, the Upper Mississippi Valley being especially suitable for its production.

It is a rapidly growing crop, some varieties maturing in 80 days. A fertile soil is essential. About three-fourths of the farms in the United States grow corn, but the bulk of the crop is produced in the Upper Mississippi Valley. Over one-half of the nation's corn is usually grown in the six corn belt states: Illinois, Iowa, Kansas, Nebraska, Missouri, and Indiana.



Iowa is the leading corn state with nearly 11 million acres. Illinois and Nebraska follow with an acreage running usually between eight and nine millions. Missouri, Kansas, and Texas have acreages running between five and six millions. South Dakota, Indiana, and Minnesota usually run between four and five

(*Continued on P. 54*)

Success *with* Cabbage

By A. E. Wilkinson

Vegetable Specialist, Connecticut Agricultural College

THE profitable marketing season for Connecticut-grown early cabbage is so short that one must go at the business of early cabbage raising with the determination of maturing heads at the very earliest period. This period commences generally about June 15 and does not extend much beyond June 20 to 25.

This statement was made by C. B. Jewett, senior partner of C. B. Jewett & Son of Hampton, Connecticut, one of the most successful early cabbage raisers in the State. From the statement one readily deducts that it is a matter of decided systematic planning if success is to be reached.

Luckily the Jewetts have a very large farm, and on this farm they have enough variation in soil and site so that they can select just the soil for early cabbage raising. They take a stony loam, rather light, in fact that type called gravelly is one that they prefer. Generally speaking, the site is on a hillside or at least on raised ground above low spots. The areas used for the crop during the last few years have been pasture land and in each instance has been fall plowed and in some instances spring plowed. Where an excellent job of plowing was performed in the fall, only spring harrowing was given.

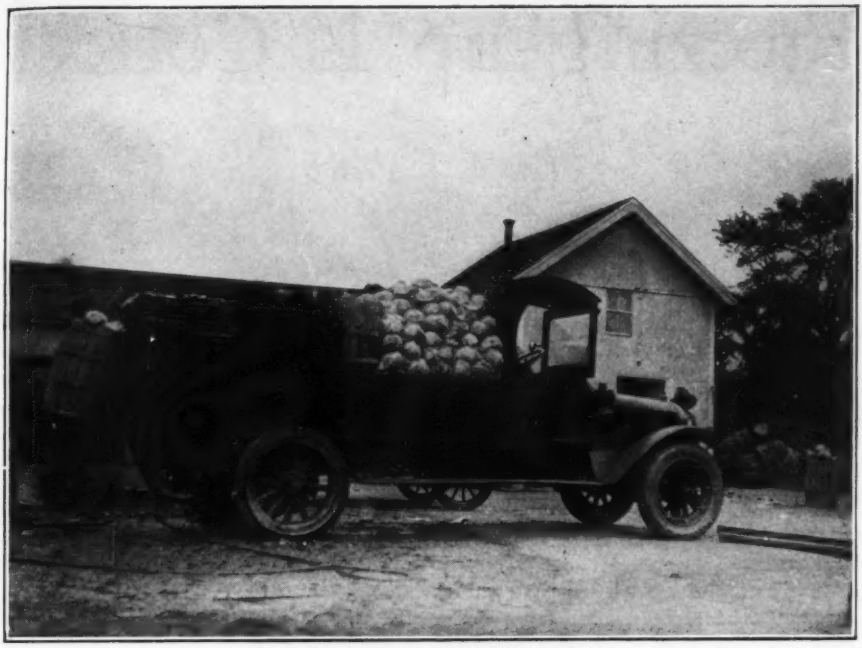
Much of the land in Connecticut is acid and, therefore, lime has been necessary. Where stone lime has been used on the Jewett farm 2 to 2½ tons per acre have given good results, or from from 1 to 1½ tons of the hydrated lime. This lime has been broadcast and worked in. Conditions on such soil have been made correct for the proper growing of a good crop. Nothing is left to chance.

The variety selected for an early crop is not Early Jersey Wakefield, but the Golden Acre strain of Copenhagen Market. This is more desirable and is a round headed, small plant, forming good quality, extra early cabbage. A particular strain of proved merit is the only one that will be tolerated on the Jewett farm.

In order to start the plants, a greenhouse is needed and the Jewetts have a 50 x 10 ft. plant house of an even span type. This house is heated with the old-fashioned flue and is giving excellent results.

The first seeds are sown in flats about Feb. 15. The flats are small wooden boxes 18 in. long, 12 in. wide and 2½ in. deep. Especially prepared composted soil is used in these flats. From 400 to 500 plants are generally obtained from each flat, and when these seedlings are extremely small, they are transplanted into other flats so that each flat contains 13 rows of plants with 9 plants in each row, making 117 plants in each flat.

Where between 28,000 to 30,000 plants are raised in this way, they are pushed along somewhat in the greenhouse but are soon shifted to cold frames or semi-hotbeds where the seedlings grow slowly but are extra sturdy and stout. They are properly hardened before being placed in the field by being gradually subjected to outside climatic conditions. Very desirable plants are thus ready for transplanting to the field on or about April 5 of each year.



Ready for market with miscellaneous load.

As previously stated, the soil has been thoroughly prepared and it only needs to be properly fertilized and marked out for transplanting. The Jewetts have a very good system of fertilizing the crop. At least one ton of 5-8-7 fertilizer is broadcast on each acre. If the land is not particularly rich, 500 lbs. more of this same fertilizer are used. The fertilizer is harrowed in and transplanting starts immediately.

On most farms, transplanting is entirely done by hand. Mr. Jewett drives a two-horse plant setter and instead of his son and another man working on the two seats in the rear of the machine and close to the ground, the son finds that he can do a better job alone. The horses are driven very slowly, and the cabbage plants are placed approximately 13 to 14 in. apart in the row. The rows are approximately 30 in. apart. It is a very short job to set out a couple of acres of cabbage in this way and where men are as familiar with the work as are the Jewetts, the work goes rapidly.

Cultivation starts as soon as the plants have been placed in the ground, the principle being not to allow the soil to pack down in between the rows, and this cultivation continues throughout the growing period every week, if possible, and not later than 10-day intervals. As soon as the plants show a small amount of growth, an application of nitrate of soda is given, using approximately 150 lbs. per acre. A small amount is placed near each plant. A little later another application is given and this, with the first fertilizing, is generally enough to carry the plant throughout the season or to a quick maturity.

It is necessary on the Jewett farm to treat the young plants with corrosive sublimate in order to control the root maggot. During the last two years only two applications have been necessary, the first on May 5 and the second 10 or 12 days later. One cupful of the corrosive sublimate mixture, which consists of 4 oz. of corrosive sublimate dissolved in 30 gal. of water,

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Freezing-up Is Correct

By A. J. Patch

Agricultural Editor, Michigan State College

DID you know that the alfalfa, wheat, or clover plants that you saw heaved up in your fields this spring were the victims of a hydraulic jack operated by Dame Nature? The new concrete pavement which was lifted and broken in some sections which were laid across low ground was damaged by the same natural force.

It is common knowledge that water expands as it freezes, and it has been generally supposed that the heaving of plants or pavements is caused by the mere expansion of the water. Recent studies by Dr. G. J. Bouyoucos and Prof. M. M. McCool of the Michigan State College soils department show that the heaving of plants is not due to the expansion of the water.

There are two types of freezing that cause damage to plants or pavements. The first type occurs when the temperature drops gradually. The water in the surface of the soil freezes, not in a solid sheet but in needle-like crystals that extend down into the soil a short distance. The growth of the crystals continues if the weather remains cold and this growth takes place at the bottom of the crystals. As this increase in length takes place, the upper end of the crystals and the surrounding soil is forced upward. Any plants present in the soil are carried along with the soil movement.

The second type of freezing, which is perhaps the more damaging of the two, occurs when the temperature drops suddenly. When this occurs, the water in the surface of the soil

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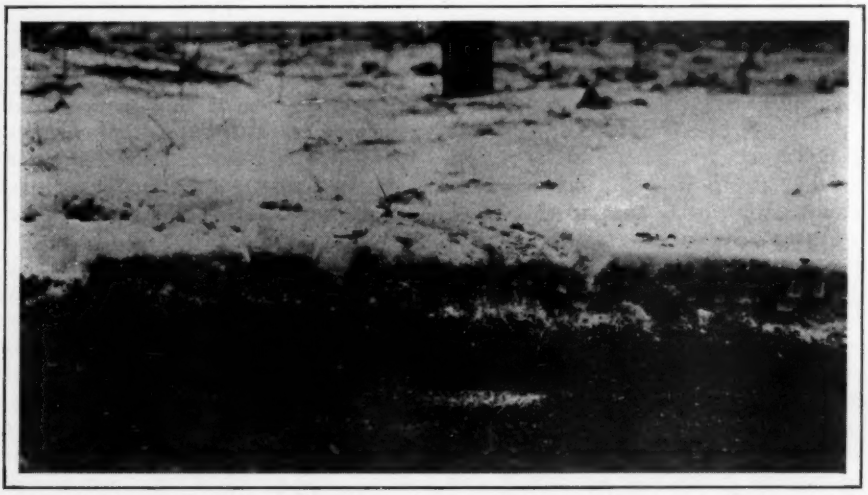
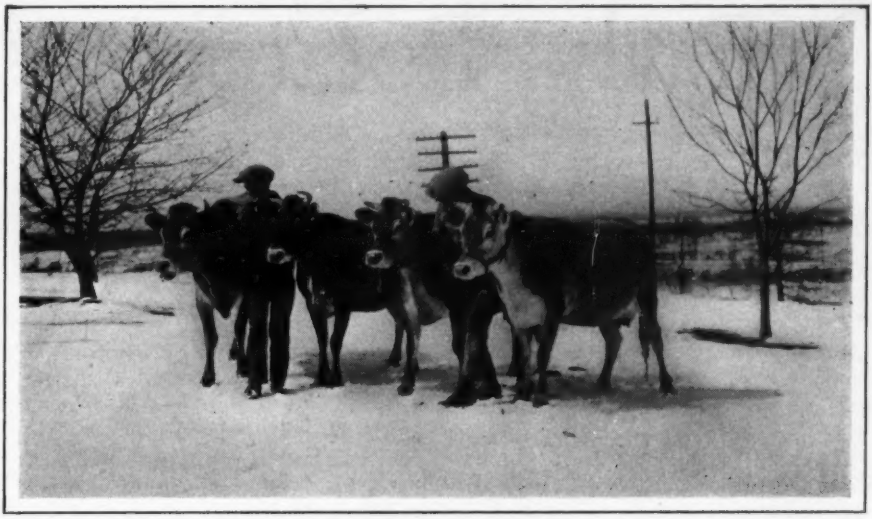


Section of soil removed to show ice formation in the soil. Each layer is forced up by the elongation of the crystals. Thawing permits the ground to subside which leaves the crowns and roots of plants exposed.



These four registered Jersey cows were bought when calves by Hinson and Sons, as a start towards developing a dairy business.

Father & Sons—PARTNERS

By M. D. Mobley

Georgia State College of Agriculture

QUITE often in the city we see such signs as John Jones & Son, over business establishments, but it is very seldom that we see a partnership between father and son in the business of farming. Why?

There are possibly many reasons, but no doubt one of the most outstanding is the fact that there is a very poor business-like relationship between most farm boys and their fathers. Very few boys are given an opportunity to earn money of their own or to transact any business until after they leave home.

A boy usually receives educational opportunities and clothing that cost as much or more than his labor on the farm, but he loses that satisfied feeling of knowing that he has earned some money of his own. The boy is denied the privilege of handling money and carrying on his small business, which would give him that much needed experience for transacting business in future years.

For a boy to handle money and transact all or a part of his business does not necessarily mean that he is to spend his money wastefully. Isn't it possible to direct to a great extent the expenditure of the money he earns?

I had the privilege recently of visiting Mr. A. G. Hinson and his two sons, Ernest and Conrad, who are

(*Turn to Page 56*)

Early Potatoes

By R. B. Fairbanks

THE importance of the early southern irish potato crop is generally recognized. While the quantity of potatoes of the northern grown stock which goes into storage the year previous has some effect on the price of the early southern crop, yet new potatoes will frequently sell for two to four times as much as old potatoes. There is something about new potatoes that makes them more in demand than the old potatoes that have gone through the winter in storage. Southern growers of this early crop realize full well, however, that the quantity of northern grown potatoes in storage will affect the prices of their early crop.

The abnormally large crop produced in 1928 will in all likelihood have the effect of slightly depressing the prices of the early 1929 southern crop. The southern growers know this and will be careful not to plant an abnormally large acreage. This is nothing but good business. They will not, however, let the large quantity of potatoes that are in storage scare them off and prevent them growing something like a normal crop. They know that in spite of all these potatoes in storage folks will want new potatoes next spring and early summer and will be willing to pay a considerably higher price for them than for the potatoes grown the previous year. This is the reason why the southern early crop continues to be one of major importance despite the increasingly large crops grown in the regular potato states of the North and West.

It is interesting to note the fertilizing methods with this early southern crop. The object being to get the new potatoes on the market just as early as possible, it is but natural that they should be forced with all possible speed. Many things enter into this matter of forcing the crop to an early maturity, among them being early and thorough preparation of the soil, and the using of a soil that contains much sand which will warm up early. However, none of these factors is so important as the matter of kind and amount of fertilizer used.

Forcing the Crop

In order to force the crop to maturity in the shortest possible time, not only are large amounts of commercial fertilizers used, but quite a high grade is practically always applied. A liberal amount of nitrogen is needed in order to force the growth, and it has generally been observed that the nitrogen should come from both the organic and inorganic sources. The leading growers prefer to have a fertilizer in which about half of the nitrogen comes from quickly available inorganic sources, such as sulphate of ammonia and nitrate of soda, with the remainder coming from the more slowly available organic sources, such as fish scrap, dried blood, cottonseed meal, etc. More and more the tendency seems to be to increase the percentage of the inorganic source, as the organic sources are so slowly available.

The use of a liberal percentage of potash is considered essential to a good yield of the early crop of potatoes.

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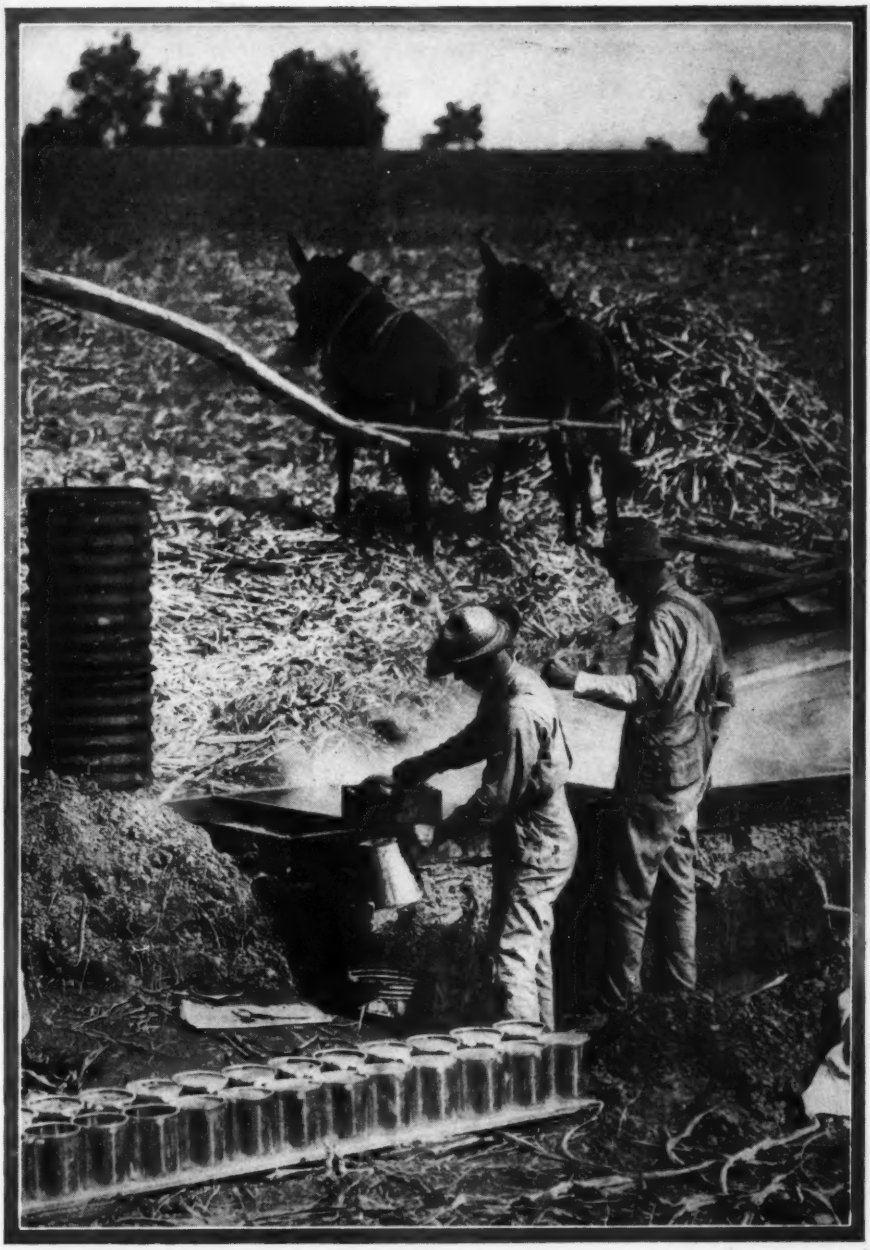
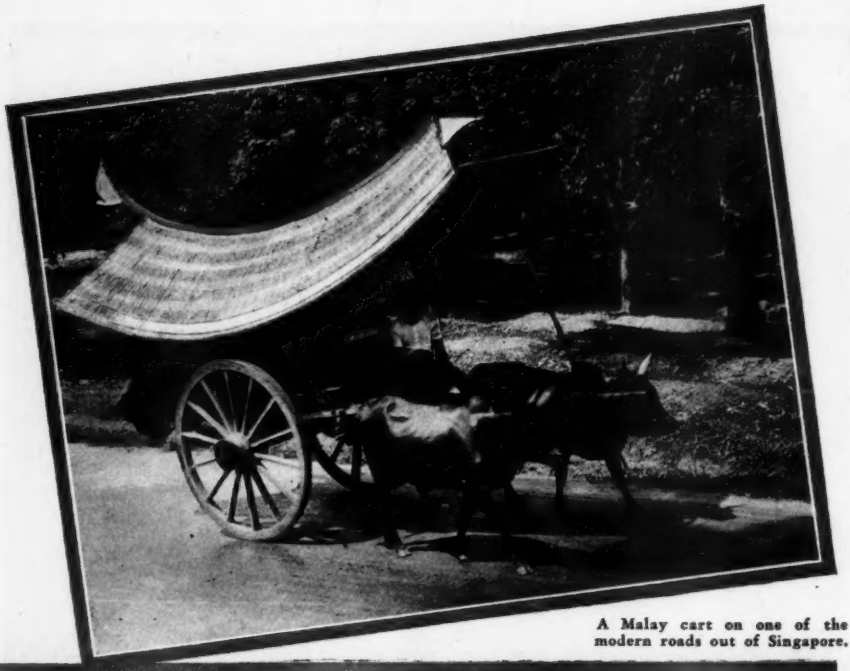


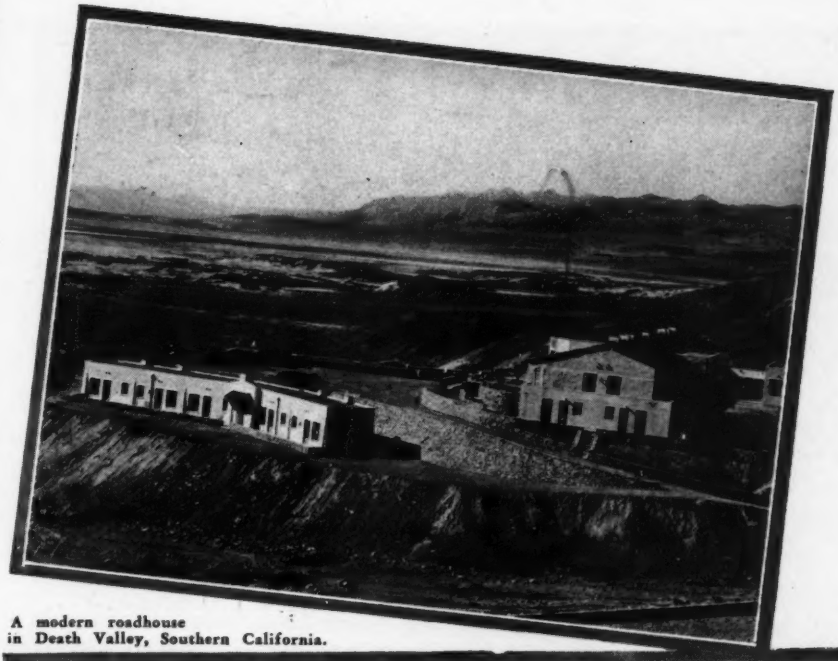
Down in the Sunny South jes a-makin' some of dat good ole sorghum 'lassus.

PICTORIAL



A Malay cart on one of the modern roads out of Singapore.

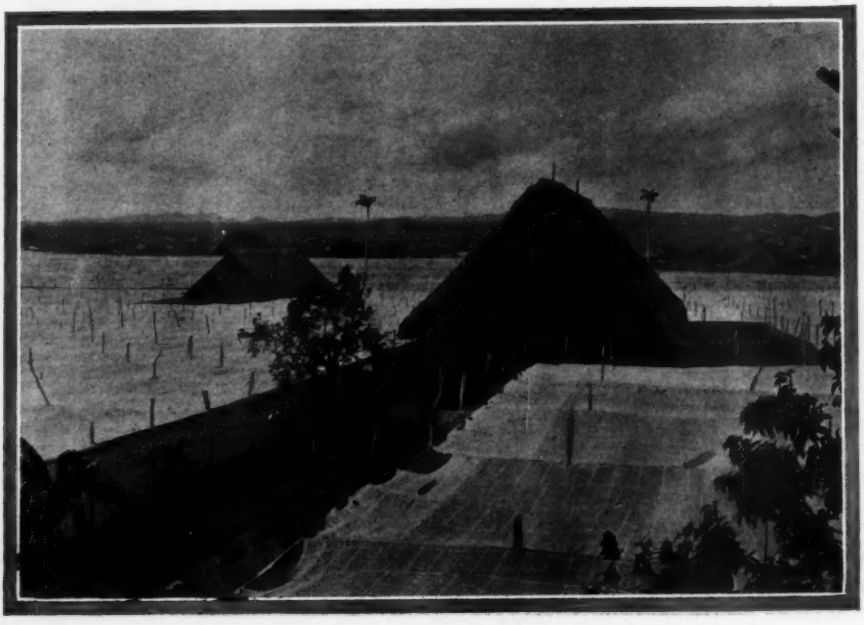
After the last wild demonstration in the old grain pit, Chicago, which is to be torn down to make way for the new Board-of-Trade skyscraper.



A modern roadhouse
in Death Valley, Southern California.

A bird's-eye view of one of America's great industries—a cotton mill in the South. Aeroplane photography is fast becoming an important industry.

A study in black and white—piccaninnies and cotton on the farm of B. L. Redwine, Newman, Georgia.



A view of tobacco barns and tobacco fields under shade in Cuba.

Lewis Gardner, for twenty years a guide in Mammoth Cave, Kentucky, going to mill on his old mule.

Stringing Georgia tobacco to hang in the barn for drying. Most of this tobacco goes into cigarettes.

Wilfred Pine, a high school senior of Lawrence, Kansas, who grew the best potatoes grown in that State last year. As a reward he won a scholarship to the State Agricultural College offered by the Union Pacific Railroad.

Right: Thelma Svarstad, 17, of Brown county, South Dakota, and William Tobias, 15, of Saginaw county, Michigan, rated the healthiest girl and boy in America at the recent contest in Chicago.

The Editors Talk

The Agricultural Outlook

Optimism is the keynote in the agricultural outlook for 1929. The present situation is better than at any time since 1920, according to Secretary Jardine after summing up the past year. He finds fewer distress areas, and his report that the gross income of American agriculture from all products for the crop year 1927-8 will be larger than that of the preceding crop year bespeaks a sounder basis for the American farmer which will carry over into the new year.

Many branches of the agricultural industry have made new gains in efficiency and production and in the adjustment of supply to demand which will continue in the 1929 programs now being formulated. There is hope to be placed in the increased interest which the American farmer is taking, not only in more efficient production, but in the marketing and distribution of his products. In the past 10 years, the number of cooperatives has grown from 5,424 to 11,400. The membership has increased five times.

The world's population is increasing; the United States' population is increasing, making the long-time outlook for agriculture very favorable.

More stable money conditions are contributing to the progress of Europe. The return to the gold standard is being reflected in a bigger demand for agricultural products than there has been at any time since the World War. This economic recovery is also illustrated by increased standards of living in Europe. Each year since the war has seen more countries on a gold basis. A stable monetary basis eliminates many difficulties and is a decided stimulant to world trade.

A more definite outlook regarding American agriculture in both domestic and foreign markets during the coming year will be reported on January 28 by the Bureau of Agricultural Economics of the United States Department of Agriculture, in cooperation with other bureaus of the department, following a Washington conference of leading agricultural economists. The report will aid farmers in adjusting production to meet market demands. Agricultural economists and extension workers from practically every state will attend the conference to discuss the agricultural situation and needs in the various States and to use the national outlook report in formulating local agricultural programs for the ensuing year.

This issuance of an outlook report is of value to every farmer and agriculturist in the country. Begun by the Bureau in 1923, these reports have been issued annually since that time and have met a popular demand among farmers. Nearly every State now has some form of organization for the dissemination and interpretation of the outlook material along State lines, since the outlook statement must be interpreted in terms of local conditions to be of greatest value to farmers. This year the work has been further extended by means of additional funds provided by Congress.

We agree with Secretary Jardine who says that timely information of this character is essential to balanced production and orderly marketing, and is

helpful not only to farmers but also to the general public. Modern agriculture can not prosper without economic information as a guide to production and marketing. When the department's outlook and intentions-to-plant reports are better understood and more generally used by farmers, an important step will have been taken toward the stabilization of agriculture.

Farm Experiments

As is well known, the National Fertilizer Association with the assistance of salesmen and agricultural agents of fertilizer companies during this past summer conducted a survey on the consumption of mixed fertilizers. We are indebted to this survey for information pointing to the fact that more and more American farmers are learning the science of agriculture by becoming practical scientists themselves.

Of the 48,000 farmers who replied to the question, "Have you ever made any comparisons with or without fertilizer?" 37.1 per cent, or nearly four out of every ten farmers interviewed, replied that they had made such comparisons. A smaller percentage, 30.3, said that they had made tests of different kinds and amounts of fertilizer.

Charles J. Brand, executive secretary and treasurer of the National Fertilizer Association, in commenting upon the replies, points out that fertilizer manufacturers, farm papers, and agricultural extension services generally encourage farmers to make tests. He states that manufacturers know from experience that the farmer who tests fertilizer on his own farm learns more accurately the analysis of nitrogen, phosphoric acid, and potash in complete fertilizer that his soil may need to produce the most profitable yields. When a farmer makes a test, usually the increase in yield, the hastening of maturity, or the improvement of quality so impresses him that he thereafter uses more and better fertilizer.

Experience is and always has been the best teacher. In adapting scientific principles to local conditions by actual experimentation on his own farm, a farmer is not only reaping the advantages of experience, but is becoming a research worker for his own community.

The survey is very interesting from the soil fertility standpoint and because it sounds a definite note in the improvement of agriculture.

Changing Management

Not every one likes a managing person. Not every one fills the role of a manager. But somebody has had to do it whether they are liked or not.

First of all, management has been individualistic in small units, in the home, the one-man farm, and shop. Then as credit and banking facilities grew, management was enlarged to relatively small companies until with the growth of commerce and manufacturing, industrial management under one man or group, has now grown to world-wide dimensions. It has become the one force that makes or unmakes the stability of large numbers of the world's population.

So vital is management in the present age that it has a philosophy of its own, but a philosophy still in the making. As one frank soul confesses, "Less is known comparatively of management than any other division of business activity. Judged purely by results, management in the average understanding of the term is a failure the world over. . . . . The science of management has yet to rise to the technique of an approach to scientific method. It is in its infancy."

Again, as Sheldon says in effect, management has to deal with new and changing forces, particularly the march of labor and science. It has to deal with new and reinvigorating standards; with new social contacts and responsibilities. There is a growing morality of business as well as the economics of business, both daily growing more complex.

The danger of management as Sheldon again points out, is not lack of activity but lack of a plan of action; a definite goal. In the elaborate planning of detail, there is danger lest the trees should blind us to the forest.

If this is true of management in industry as a whole, it is doubly true of management in agricultural industry. Agricultural industry has a multitude of stimuli in the form of government research stations and other scientific efforts set up by the state to see to it that its agriculture is properly developed. At the same time, because agriculture is fundamental to the life of the nation, the state sees to it that as far as possible agriculture is conducted for the benefit of the nation, which puts a heavier responsibility on agricultural industry.

To bring over this scientific effort of the state into agricultural industry and harmonize such effort both in its organization and in the results of its findings, is one of the great problems of management so far as agricultural business is concerned. The next decade will undoubtedly witness more progress and more changes in this field than have occurred in the last hundred years. Happy is management if it sees the picture clearly in advance. This is the urgent need.

Exchanging Ideas

IT is always useful to exchange ideas especially regarding the methods and results of research and experimental work. As is well known, many research workers in Europe are busily engaged in projects that are of importance, not only to the thought of Europe but to other countries as well. The same, of course, is true of American research work.

In order to be of some assistance to agricultural workers in the United States, we shall be very glad to supply translations of some recent papers, relating to work conducted in Europe. The first releases relate particularly to work conducted in Germany. From time to time however we hope to add translations regarding work in France and possibly other countries.

The first list of translations available include references to the famous work of Dr. E. A. Mitscherlich on the Law of Growth. This law is of course a vital topic of discussion and the paper, "For or Against the Law of the Effect of the Growth Factors," is a stimulating discussion on the subject.

Another very practical and interesting paper which deals in part with Mitscherlich's law is a discussion by Dr. A. Jacob on "The Law of Minimum in New Forms."

"How Shall I Fertilize?" is a growing and important question in the United States; hence a paper on the determination of fertilizer requirements by Dr. Vageler is of value and interest.

Another excellent paper along the same line is "Studies on Continuous Cropping with Regard to the Neubauer Method," by Prof. Dr. Roemer. The Neubauer method is, of course, attracting attention in the United States. This paper by Dr. Roemer is therefore of interest to many workers.

Diseases are represented by a paper on the "Clearing Disease or White Pest, a New Soil Disease," by I. Hudig and C. Meyer.

A final paper is on the question of "Controlling Rust in Winter Wheat," which is of great practical importance in the United States.

These papers are listed in detail in another part of BETTER CROPS WITH PLANT FOOD. Knowing the interest that is growing among research workers regarding work done abroad, and also knowing that many workers are so busy that the time for making translations is extremely limited, we will be glad indeed to send free of charge copies of any or all of these translations to any one requesting them.

Cooperators in the Soil

Cooperation as a remedy for business ills is frequently urged. Especially has it been recommended to farmers to help them surmount their business depression. The recent favorable trend of agriculture indicates that the cooperation used has been valuable.

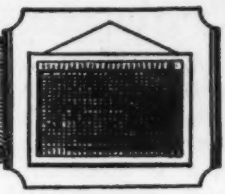
Most of the cooperation has been among farmers or groups of farmers. A type of cooperation sometimes overlooked or unrecognized is that among the various factors in crop production. Some factors cooperate of their own accord, while others must be helped along by the farmers.

A cooperation that frequently must be aided, is that between fertilizers and lime. There are frequent cases on record where one or the other applied alone was not beneficial, or only slightly so. When both were applied, large increases in yield resulted. There is not much use in making the soil sweet if there are no nutrients in it to nourish the plant. Neither is it economical to apply fertilizer to a soil under such conditions that plants cannot use it, which appears often to be the case when the soil is acid. These facts are brought out well by the work of Thorne (Ohio Bulletin No. 381), when he found that fertilizer alone in a 5-year rotation increased the yield of corn 17.51 bushels per acre over the untreated plot. The lime alone increased the yield 12.37 bushels over the untreated plot, while a phosphate and potash fertilizer added to the lime further increased the yield 21.24 bushels over the limed plot.

White (Pennsylvania Bulletin No. 195), in his pasture experiment at Snow Shoe, found that lime alone increased the yield of blue grass and sweet clover 162 lbs., while a phosphate and potash fertilizer added to the lime further increased the yield 2,993 lbs.

These results illustrate the facts found on many crops in many localities, namely, that best results are secured only by using lime and fertilizer in cooperation with each other.

AGRICULTURAL DEVELOPMENTS



By P. M. Farmer

MARK MR. MILLER

It isn't so much nowadays to grow a ton litter of pigs, although only good farmers do it. But to grow 8 ton litters all in one season is still a great accomplishment. In fact, only one man is known to have accomplished this feat in pork making. He is Mark E. Miller of Enfield, White county, Illinois. More remarkable still, Mr. Miller made this record with 8 out of only 9 litters farrowed on his farm the past season. Mr. Miller's section of the State, the southern part, is not usually considered a leading hog raising section. He used stock with good blood lines and followed the advice of the agricultural college as to sanitation and feeding. The 9 litters fed by Mr. Miller contained 93 pigs and fed to a total weight of 20,610 or an average of 2,290 pounds for the 9 litters. The receipts from the 9 litters amounted to $2,323.17.

WORSE THAN QUACKGRASS

Quackgrass and the Canada thistle have long been listed as about the worst curses one farmer could wish on another. But our farmers are always on the lookout for better things, and now they have a weed that is even better as a weed than the old-time leaders. This new one is Austrian field cress, and the most recent reports of its presence have come from Minnesota, where it was found occupying a quarter-mile strip along a roadside in Lyon county. It was first noticed in a field of the Wisconsin Experiment Station at Madison, where it probably grew from seed brought in with farm crop seeds from Europe. Two years later it was found near the State line between New Jersey and New York, and in 1926 was found near Rochester, Minnesota. Even after ground has been kept clear of vegetation for two years the roots of this weed will send up shoots, and experience caused specialists at Wisconsin to describe the weed as "more persistent than quackgrass or Canada thistle." It belongs to the mustard family. It is so difficult to eradicate that Minnesota farmers who have had experience with it believe the State should use general funds or make a special appropriation to kill out the infestations.

MOTORIZED SOIL TESTING

The portable soil testing laboratory of Ohio's extension service has many advantages, says Earl Jones, soils and crops specialist of that service. From the middle of March to the first of November, excepting harvest season and time out for the State Fair, the laboratory was working steadily, testing 5,348 samples of soil. The specialists with the portable soil equipment held 163 meetings in 29 counties. One great advantage of the method is the direct observation that can be given the fields and the methods in use on the farms from which the samples are taken. Jones says "we see actual demonstrations that otherwise would remain unknown to us; we get the reactions of farmers to the use of fertilizers; and we get the results of liming and of different drainage systems."

ALUMINO-SILICIC ACID

The old, old question, "What makes soils acid?" has been solved by three scientists at the University of Wisconsin. They say the typical acid reaction is produced by alumino-silicic acid, and now the way is open to the solution of the question, "What can be done about it?" The men who did the work are Emil Truog, of the agricultural staff, inventor of the Truog soil tester, who was in charge of the work; H. W. Kerr, a government student from Australia; and J. A. Chucka, of Marinette county, Wisconsin, a graduate student. They have been able to separate large quantities of the acid from soils. The acid is said to be very common in the soil and in a rock called "bentonite." Truog says it has as much power for good as for bad.

Not all the diggers are "ditch diggers."

BIRDS BRING HONOR TO BIRD

C. M. Bird, of Meyersdale, Penn., President of the International Turkey Show, was recently awarded a silver loving cup by a publication devoted to turkeys. Mr. Bird and another "Bird," his brother, have a world-wide reputation as breeders of Bronze turkeys and are said to have won more turkey prizes than any other at the Madison Square Garden Poultry Show.

"BUG" VERSUS BORER

Dr. Tage Ellinger of Chicago, research director of the International Corn Borer Investigations, says that disease-producing bacteria and natural immunity developed in the corn plant may possibly help a great deal in reducing the menace of the corn borer. He says investigators of the Pasteur Institute of Paris have found that infested plants developed immunity and that there are in Europe a certain varieties of corn entirely free from borer infestation. In calling attention to the bacterial enemies of the borer, Doctor Ellinger says that spraying with fluids containing these bacteria may become an effective means of wiping out the pest. Anyway, these are nice things to think about while carefully turning under corn-stalks and weeds.

INTEREST IN IODINE

Iodine as it enters into the content of feeds, soils, and water has been the subject of considerable interest in South Carolina. Of the vegetables analyzed spinach, mustard, lettuce, and sweet potatoes carried the most of this element. Vetch, alfalfa, Austrian winter field peas, soybeans, and oats were the livestock feeds highest in iodine. The top six inches of soil were shown to be lowest in iodine; there was more in the next six inches; and the third half foot had a still higher content. City water supplies were found to lose much iodine in the purification process. Rivers showed a varying content—two to six parts in a billion.

WASTED FERMENTATION

Don't waste fermentation on feeds like hay, corn stover, and straw, says the University of Illinois after investigating this method to see if it would make the roughages more effective. This "converting" of feeds which has been advertised to Illinois farmers along with materials called "converter" is said to be a decided flop. Results of Canadian experiments are quoted to show that the processed feed was no better than corn silage and that cows fed the dry unprocessed roughage gave just as much milk as those getting the so-called "converted" feed. And there was a great difference in the cost, for the "converter," consisting of salt, slaked lime, and vegetable matter, is not given away.

European Universities

By Rodney Fox

Ames, Iowa

"THE universities are able to get information to the European farmer much more easily and with less 'bally-hoo' than in America," says Dr. E. W. Lindstrom, professor of genetics at Iowa State College, Ames, who has just returned from a year spent abroad, and explains that the farmers of northern Europe have a much higher level of education than American farmers. Dr. Lindstrom worked during the past year with the Educational Board of the Rockefeller Foundation which has for its purpose the development of international relations along the lines of science and education.

The board works through the exchange of fellowships for students of the advanced type, about 120 men being placed each year. It is required that fellows study in a foreign country because the administrators feel it is the duty of the home government to educate its own students. Because America is not outstanding in many lines of science, only about 20 per cent of the students are placed here.

The foundation also has millions of dollars invested in universities and research stations in England, Holland, Sweden, France, Italy, Switzerland,

The "Backs" at Cambridge, England.

Belgium, and Roumania. The most recent gift is that of three and a half million dollars to Cambridge University in England for the benefit of agriculture and biology. Dr. Lindstrom's work of inspecting the colleges and examining students for fellowships took him into every leading university in Europe.

Respect Education

"The traditional respect for education in the old world dignifies the college training in the eyes of the students," says Dr. Lindstrom. "Competition is so great that only the best men survive as teachers and experimenters, and although investigation is done on a smaller scale than in America, many valuable results are obtained."

The people are trained in the elementary and folk schools which, though they have a touch of the practical, are largely cultural and much more thorough than American schools. European colleges do not tie up closely with practical agriculture. Professors are not required to limit themselves to experiments that have an immediate commercial value, and they have the opportunity to develop projects of the greatest importance. On the other hand, the colleges get out of contact with the farmers and suffer a resultant loss of their practicability.

In general, the agricultural schools are supported by the state or ministry of agriculture. Experiment stations are not connected with the universities but are under the agricultural ministry or are maintained by farmers' organizations of which there are a great many in Europe.

The war left the Europeans with the problem of obtaining an adequate food supply, and they have solved it partly by the application of scientific agriculture. They breed for performance rather than for appearance, and the European farmers easily beat American farmers in production.

The students in the old countries are serious, hard-working, and undemonstrative. Only the wealthy class can afford an education, and there is no chance for a student to work his way through school. Working is considered undignified, and the studies do not allow much time for other activities. Because of the traditional respect for education, much attention is given scholastic attainment, and the city population turns out to attend a doctors' examination. The candidate must be prepared to debate his thesis with anyone in the audience.

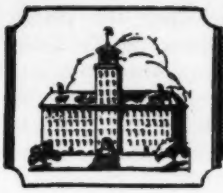
Only 10 per cent of the administration of an American university is necessary in the European college. There is only one professor in a department, and he has complete charge of planning his course of study and of directing his staff of assistants. The office of dean is rotating, one professor holding the position for several years and then passing it on to the next one in line.

Professors Are Noted

Dr. Lindstrom met a number of famous agricultural and scientific leaders, among them such men as Sir John Russell of the Rothamsted Experimental Station; Sir Daniel Hall, director of the John Innes Horticultural Institution; and J. B. S. Haldane, reader of Biochemistry at Cambridge and also connected with the John Innes Horticultural Institution.

"Mr. Haldane is a brilliant scientist, a genius of the eccentric type who specializes in genetics and human physiology," according to Dr. Lindstrom. "He will seal himself into a chamber or inject chemicals into his blood until he faints, but he is a man of considerable physical vigor."

Dr. Lindstrom thinks the four most impressive colleges in Europe in the order of their importance are Cambridge, England; Dohlem, Berlin, Germany; The University of Copenhagen, Denmark; and Wageningen at Stockholm, Sweden.



REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture and the State Experiment Stations relating to Soils, Fertilizers, Economics, Crops, Crop Diseases, and Insects. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

The influence of various nitrogen fertilizers on availability of phosphate and potassium in a number of soils was studied by J. F. Fudge, in "The Influence of Various Nitrogenous Fertilizers on the Availability of Phosphate and Potassium," Bulletin 327 of the Agricultural Experiment Station, Auburn, Ala., July, 1928. Acid-forming fertilizers caused a marked decrease in phosphate availability and an increase in water soluble potassium, at the expense of the potentially available supply. Basic fertilizers caused an increase in phosphate availability and a reduction in water-soluble potassium, but tended to conserve the potentially available supply.

Several bulletins dealing with cotton and other important crops in Mississippi were received this month. The several authors show that cotton usually does best with a complete fertilizer, 6-8-4 and 6-8-8 (NPK) analyses being recommended at 500 to 600 pounds per acre. The higher potash fertilizer is especially necessary where rust is prevalent. A complete fertilizer is also recommended for tomatoes, cabbage, and sweet potatoes. These bulletins are as follows:

"Cotton Production (Central Station) 1927," Agr. Exp. Sta., A. and M. College, Miss., Bul. 249, Jan., 1928, J. F. O'Kelly and W. W. Hull.

"Cotton Fertilizer Experiments," Agr. Exp. Sta., A. and M. College, Miss., Bul. 250, Jan., 1928, C. B. Anders and W. W. Hull.

"Cotton Experiments, 1927," So. Miss. Exp. Sta., Poplarville, Miss., Bul. 251, Dec., 1927, E. B. Ferris.

"Report Raymond Branch Experiment Station, 1927," Raymond, Miss., Bul. 252, Dec., 1927, H. F. Wallace.

"Report Holly Springs Branch Experiment Station, 1927," Holly Springs, Miss., Bul. 253, Dec., 1927, C. T. Ames and Otis B. Casanova.

What happens to potash when it is added to the soil?

It has long been known that the soil holds potash firmly enough to prevent the rapid loss by leaching of this important plant nutrient. It has also been thought that this potash held by the soil (adsorbed) could be used by growing plants as needed. This arrangement of nature was considered very convenient, as one simply threw some potash on his soil once in a while and let nature feed it to the plants in the necessary quantities. This very haphazard procedure was excused owing to the lack of definite knowledge on the mechanics of this adsorbing and releasing of potash. However, fuller information on the action of potash in the soil has been secured by J. F. Brezeale, in "Soil Zeolites and Plant Growth," Agricultural Experiment Station, Technical Bulletin 21, Tucson, Arizona, June 1, 1928.

The author points out that if potash salts are added to moist soils they are fixed or adsorbed almost instantaneously by a material in the soil called zeolite. This zeolite is really a mineral which arises under proper conditions when other soil minerals decompose. A queer thing about this zeolite is

that it also apparently decomposes in soils that are depleted of their bases, such as potash, lime, magnesia, and soda. However, when these bases are added to a soil as fertilizer or lime, the zeolite again forms and adsorbs the bases thus keeping them from quickly washing away. If this were the whole story, we would not have to worry about these zeolites as they can build up as necessary, even after having been completely broken down, due to removal of all bases from the soil.

However, another interesting set of experiments by Brezeale show the danger of allowing the soil to become exhausted of its bases. He took a soil and repeatedly treated it with a potash salt until it would not adsorb or fix any more. This high potash soil was then used as a nutrient medium for six crops of wheat seedlings grown in a water culture. Each crop was grown 19 days and then analyzed. The author found that all the available potash had been removed from the soil as shown by the plants analyzed. This soil was then again treated with potash and wheat seedlings again grown with it as the nutrient medium. In comparison to this, some fresh soil saturated with potash was used for another set of plants. The results showed that the depleted soil was able to readsorb only about half of what the original soil was able to adsorb. Thus by depleting the soil of its bases he injured it more or less permanently. It is quite obvious that careful soil management requires that potash and lime be added to the soil before waiting until it becomes actually starved, as the injury may be more or less permanent.

In another experiment, Professor Brezeale took a soil and treated one part with potash, another part with soda, another part with lime, and another with magnesia. Using these as nutrient media, barley seedlings were grown on them and the plants analyzed to determine the potash they were able to use from each soil sample. The results showed that the plants were able to take some potash from the lime, soda, and magnesia soils, but only about half as much as from the potash soil. This would indicate that we have to feed the plant potash if we want it to get plenty of potash for good growth.

Although this is a technical bulletin, the methods and data are presented in such a clear way that one with only an elementary knowledge of chemistry can understand it. Other interesting experiments along the same lines as those mentioned are included, and they all go to show how research methods may be used to attack difficult and practical problems of agriculture.

"When to Use Lime for Vegetable Crops," Ext. Serv., Agr. Col., Amherst, Mass., Ext. Leaflet 52, June, 1928, Ray M. Koon.

"High Grade Fertilizers for Profit," Agr. Exp. Sta., East Lansing, Mich., Cir. Bul. 53, Mar., 1928, M. M. McCool, G. M. Grantham, P. M. Harmer.

"Value and Care of Farm Manure," Ext. Div., Michigan State College, East Lansing, Mich., Ext. Bul. 71, Apr., 1928, John W. Sims.

"Testing Fertilizers for Missouri Farmers, 1927," Agr. Exp. Sta., Columbia, Mo., Bul. 260, Apr., 1928, L. D. Haigh.

Soils

The importance of considering th subsoil as well as the surface soil in locating and interpreting fertilizer results is very clearly brought out by M. B. Hoffman and G. R. Schlubatis in their bulletin, "The Significance of Soil Variation in Raspberry Culture," Michigan Agricultural Experiment Station, Special Bulletin 177, June, 1928. This is especially true with fruit growing, since the crop is to remain in one place for a period of years and because deep rooting seems to be essential to favorable production. The area of ground reported here was of rather uniform appearance on the surface and was selected as a good field for a raspberry fertilization experiment. It was fairly level, well-drained, and apparently typical of the

soils in this section devoted to raspberry culture.

Yields showed wide variations not only among the treatments, but also among duplications of the same treatment. The latter led to soil studies. A great variation in depth to a hard clay layer which caused differences in height of a perched water table was found to be the factor influencing yields more than fertilizer treatment. With a water table near the surface, soil roots were usually poorly developed and yields low, while the reverse was true if the water table was lower. The authors wonder what conclusions as to fertilizer requirements of raspberries might have been drawn from these differences in yields due to soil variation if treatments had not been duplicated and check treatments maintained.

Drs. T. L. Lyon and B. D. Wilson of Cornell have determined the effects of various green manure crops on the accumulation of nitrates in the soil. Their findings have been published in a new New York bulletin, Memoir 115, "Some Relations of Green Manures to the Nitrogen of a Soil." They found the accumulation of nitrate during the fallow period greatest following the plowing of vetch. Other crops in order of effectiveness in this respect were rye, peas, oats, and buckwheat. They concluded that not all legumes are more effective than non-legumes in producing a high content of nitrates during the main part of the growing season. Plowing under a crop in the Fall was superior to plowing under in the Spring. Liming the soil increased accumulation of nitrate nitrogen. Farmers interested in building up their soil by the use of green manure will find this bulletin full of valuable information for them.

"The Use of Alcoholic Salt Solutions for the Determination of Replaceable Bases in Calcareous Soils," Agr. Exp. Sta., Tucson, Ariz., Tech. Bul. 20, May 15, 1928, O. C. Magistad and P. S. Burgess.

"Soil Survey of Iowa, Clarke County, Agr. Exp. Sta., Ames, Iowa, Report No. 51, June, 1928, W. H. Stevenson, P. E. Brown, A. M. O'Neil, L. W. Forman, H. R. Meldrum.

"Soil Survey of Iowa, Winneshiek County," Agr. Exp. Sta., Ames, Iowa, Report No. 52, 1928, W. H. Stevenson, P. E. Brown, T. H. Benton, L. W. Forman, H. R. Meldrum, R. E. Bennett.

"Soil Survey of Iowa, Appanoose County," Agr. Exp. Sta., Ames, Iowa, Report No. 53, June, 1928, W. H. Stevenson, P. E. Brown, C. L. Orrben, L. W. Forman, H. R. Meldrum, A. J. Englehorn.

"Liming the Soil," Ext. Div., Col. of Agr., Lexington, Ky., Cir. 59, May, 1928, P. E. Karraker.

"Soil Erosion and Its Control," Col. of Agr., Lexington, Ky., Cir. 120, Mar., 1928, George Roberts, J. B. Kelley, E. G. Welch.

Crops

With the increasing interest on the part of farmers all over the country to improve the appearance of their premises, more attention is being given by agricultural colleges and extension workers to helping farmers achieve this goal. In line with this movement, Purdue University has just published their revised edition of Leaflet 41, "How to Make and Maintain a Lawn," by S. D. Conner and M. L. Fisher. This leaflet will undoubtedly be in popular demand by suburbanites, as well as farmers, who are looking for sound information on fertilizing, seeding, and caring for a good lawn.

An interesting new bulletin on strawberries has been published by the Massachusetts Agricultural College under the title, "Strawberry Growing in Massachusetts," Extension Leaflet 29, by A. P. French. The author has treated well the various problems which the successful grower of this popular crop must meet and overcome.

Other crop bulletins of the month include:

"Thirty-Eighth Annual Report," Agr. Exp. Sta., Auburn, Ala.

"Agricultural Themes," Dept. of Agr., Tallahassee, Fla., Vol. 38, No. 4, Oct., 1928.

"Farming in Indiana—Then and Now," Agr. Ext., Purdue University, Lafayette, Ind., Ext. Bul. 154, July, 1928, George Ade.

"Alfalfa," Ext. Div., Col. of Agr., Lexington, Ky., Cir. 70, May, 1928, Thomas P. Cooper.

"Work in Progress at Highmoor Farm," Agr. Exp. Sta., Orono, Maine.

"Work in Progress at Aroostook Farm," Agr. Exp. Sta., Orono, Maine.

"Thirteenth Annual Report," Ext. Serv., Univ. of Maryland, College Park, Md., T. B. Symons.

"Tomato Production," Ext. Serv., Agr. Col., Amherst, Mass., Ext. Leaflet 51, May, 1928, G. B. Snyder.

"Grape Growing in Massachusetts," Ext. Serv., Agr. Col., Amherst, Mass., Ext. Leaflet 64, Apr., 1928, Fred C. Sears.

"The Breeding of Strains of A-Tester Yellow Dent Corn," Agr. Exp. Sta., East Lansing, Mich., Tech. Bul. 90, Apr., 1928, K. M. Liu.

"Annual Report of Extension Work for 1927," Ext. Dept., Miss. A. & M. College, A. and M. College, Miss., Ext. Bul. 49, July, 1928, R. S. Wilson.

"Forty-first Annual Report," Agr. Exp. Sta., Lincoln, Neb., W. W. Burr.

"Vinifera or European Grapes in New York," Agr. Exp. Sta., Geneva, N. Y., Cir. 101, Apr., 1928, Richard Wellington.

"Fruits Recommended for New York," Agr. Exp. Sta., Geneva, N. Y., Cir. 103, Apr., 1928.

"Grape Pruning," Agr. Exp. Sta., Geneva, N. Y., Cir. 104, Apr., 1928, F. E. Gladwin.

"Annual Report of the Board of Control for the Fiscal Year Ending June 30, 1927," Agr. Exp. Sta., Reno, Nev.

"The Bimonthly Bulletin," Agr. Exp. Sta., Wooster, Ohio, Vol. XIII, No. 6, Whole No. 135, Nov.-Dec., 1928.

"Grain and Sweet Sorghums in Oklahoma," Agr. Exp. Sta., Stillwater, Okla., Bul. 180, Aug., 1928, A. Daane and K. H. Klages.

"Moisture in Combined Wheat," Agr. Exp. Sta., Stillwater, Okla., Bul. 183, Sept., 1928, A. Daane.

"41st Annual Report," Agr. Exp. Sta., State College, Pa., Bul. 230, July, 1928.

"Austrian Winter Field Peas," Agr. Col., Clemson, S. C., Cir. 96, Sept., 1928, R. W. Hamilton.

"Fortieth Annual Report, 1927," Agr. Exp. Sta., Knoxville, Tenn., C. A. Mooers.

"Report on the Agricultural Experiment Stations, 1927," U. S. D. A., Washington, D. C., E. W. Allen, W. H. Beal, and J. I. Schulte.

Economics

During the past few years many farmers' cooperatives have been organized. Often-times cooperatives have been organized without much thought being given to the lessons learned by other cooperatives. Bulletin 461, "Farmers' Cooperative Business Organizations in New York," by J. F. Booth, and published by Cornell University, gives a picture of the development and status of farmers' cooperative business organizations in New York State. Special attention has been placed on the reasons for the success of some associations and the cause of failures of others. This is a valuable bulletin for cooperatives.

For many years general property taxes on farm property have been increasing. In some states the cost of collecting this tax is much greater than in others. Cornell University's new Bulletin 469, "The Collection of General Property Taxes on Farm Property in the United States, with Emphasis on New York," by M. Slade Kendrick, is a study of the methods of collecting these taxes, in order to determine what methods are in use and which are the most satisfactory.

"Cattle-Ranch Organization in the Mountains of Colorado," Agr. Exp. Sta., Fort Collins, Colo., Bul. 342, Sept., 1928, R. T. Burdick, Martin Reinholt, G. S. Klemmedson.

"Farmers' Cooperative Buying and Selling Organizations in Michigan," Agr. Exp. Sta., East Lansing, Mich., Spec. Bul. 171, May, 1928, C. F. Clayton and J. T. Horner.

"The Progress of Cooperative Marketing in Mississippi," Ext. Dept. Miss. A. & M. College, Miss., Ext. Bul. 48, May, 1928, T. M. Patterson.

Diseases

Two new tobacco bulletins from Kentucky, No. 280 "Observations and Experiments on the Control of True Tobacco Mosaic," and No. 281, "Tobacco Frenching-A Nitrogen Deficiency Disease," both by W. D. Valleau and E. M. Johnson, are welcome additions to available literature on the diseases which have caused such great losses in recent tobacco yields. While the bulletins are of a more or less technical nature, growers will find much in each which will aid them in a better understanding of these diseases.

Bulletin 262 of the Virginia Agricultural Experiment Station, "The Control of Cereal Smuts by Seed

Treatment," written by F. D. Fromme, is another weapon in the outstanding fight to control the diseases which take such great toll from annual farm profits. The bulletin is well-illustrated and detailed in describing the control methods used.

"Sulphuric Acid Spray: A Practical Means for the Control of Weeds," Agr. Exp. Sta., Tucson, Ariz., Bul. 128, July 1, 1928, J. G. Brown and R. B. Streets.

"Michigan Raspberry Diseases," Agr. Exp. Sta., East Lansing, Mich., Spec. Bul. 178, June, 1928, C. W. Bennett.

"The Relation of Bacterium Vignae to the Tissues of Lima Beans," Agr. Exp. Sta., State College, Pa., Bul. 226, May, 1928, W. S. Beach.

Insects

"Cape Cod Cranberry Insects," Agr. Exp. Sta., Amherst, Mass., Bul. 239, Feb., 1928, Henry J. Franklin.

"The Fulgoridae or Plant-Hoppers of Mississippi, Including Those of Possible Occurrence," Agr. Exp. Sta., A. and M. College, Miss., Tech. Bul. 14, Dec., 1926, Herbert L. Dozier.

"Phyllophaga of Mississippi," Agr. Exp. Sta., A. and M. College, Miss., Tech. Bul. 15, J. M. Langston.

"Cotton Flea Hopper Studies of 1927 and 1928," Agr. Exp. Sta., Clemson College, S. C., Bul. 251, Oct., 1928, C. O. Eddy.

Translations

THE following translations of papers on scientific subjects published abroad are valuable to agricultural workers, particularly in the agricultural experiment stations and colleges, who may be interested in the subjects mentioned. We shall be glad to send copies free of charge.

"For or Against the Law of the Effect of the Growth Factors"	Prof. Dr. E. A. Mitscherlich, Konigsberg, East Prussia	Zeitschrift fur Pflanzenernahrung u. Dungung. Teil B. VII. No. 8, Aug. 1928, p. 345.
"The Law of Minimum in New Forms"	Dr. A. Jacob, Berlin.	Die Ernahrung der Pflanze. XXII Jahr. No. 16, Aug. 15, 1927.
"How Shall I Fertilize?"	Dr. Vageler, Konigsberg.	Die Ernahrung der Pflanze, XXIII, Nr. 17.
"Studies on Continuous Cropping with Regard to the Neubauer Method"	Prof. Dr. Th. Roemer, Halle A. S.	Die Ernahrung der Pflanze. XXIV, No. 11, June 1, 1928.
"Clearing Disease or White Pest, a New Soil Disease"	I. Hudig and C. Meyer, Groningen	Zeitschrift fur Pflanzenernahrung u. Dungung. Teil A, Band VIII, 1926/27, No. 1, S. 14. Verlag Chemie.
"Question of Controlling Rust in Winter Wheat"	Dr. Engelmann, Leipzig	Die Ernahrung der Pflanze, XXIV, No. 7, April 1, 1928.
"The Life Work of Liebig"		Die Ernahrung der Pflanze, No. 10, 1928.

Early Potatoes

(*From Page* 30)

Six to eight per cent of superphosphate is generally considered necessary and about an equal amount of potash. The 7-5-5 analysis or 7-5-6, that is, 7 per cent superphosphate, 5 per cent nitrogen, and 5 to 7 per cent potash, is generally considered about right.

In the Wilmington, North Carolina, commercial potato section a 7-5-7 is ordinarily used. In the Charleston, South Carolina, section the 7-5-5 and 7-5-6 are commonly used. In the Elizabeth City, North Carolina, commercial section a 7-5-5, 7-6-6, and 7-6-7 are the analyses generally used. On the very sandy soils, growers raise the percentage of nitrogen from 5 to 6 per cent and the potash from 5 to either 6 or 7 per cent.

In Virginia the tendency seems to be to get the analysis more nearly to a 7-6-7 than to continue to use the old 7-5-5. The additional amount of potash has been found profitable. Many believe that in this race for getting the potatoes to market at the earliest date possible, that the standard analysis will soon be a 7-7-7, or equal percentages of these three fertilizer ingredients.

Not only are high grade materials used, but liberal quantities of them. The standard amount used in the Southeast is one ton per acre. Some use a few hundred pounds less and many a few hundred pounds more. Some of the best growers use as much as 2,500 pounds per acre. That it pays to use these large quantities of high grade fertilizer is not a question. These growers have tested it out to their own satisfaction over a long period of time. Usually a fine crop of corn, cowpeas, soybeans, or other feed crop follows the irish potato, and whatever portion of the fertilizer remains in the soil is used by these feed producing crops.

In some sections, growers insist that the potash come from sulphate of potash in preference to the muriate. When the muriate is first applied to the soil it produces ammonium chloride, a substance which seems to be somewhat poisonous to the potato. However, if the muriate of potash is applied at least two weeks before the potatoes are planted usually this ammonium chloride will be dissolved by the moisture in the soil and no harmful effects will result. The South Carolina Experiment Station, as a result of a six-year test, using the various kinds of potash, has arrived at the conclusion that it makes little difference from what source. the potash is obtained. However, it was noted that the plots receiving muriate of potash produced 30½ bushels more potatoes than where no potash was applied, thus showing very conclusively that potash is essential. This point, however, is no longer questioned by the growers.

Cabbage

(*From Page* 27)

is poured quickly on the center of the plant. The liquid runs down around the stem and in turn to the roots and is very effective in killing the maggots.

As soon as the cabbage heads are formed, which is about June 15, the truck is pulled out in the field and the cabbage heads are cut, loaded, and sold just as fast as they can be harvested.

During the year 1928, five loads in one day were taken out of the field and sold at the time when the market was at its best. This continues until the field is entirely cleared of marketable heads, and this requires only a few days because, with the system of growing the crop, the total heads are ready to sell almost at one time.

Pages From A Field Note Book

Fertilizers Made the Difference

By Harry Q. Holt

Remington, Indiana

ARTHUR SIGO, a 15-year-old Jasper county, Indiana, potato club boy, proved the value of commercial fertilizers in producing potatoes by fertilizing every other row. The plot was a measured one-fourth acre of black sandy loam, and had exactly 22 rows. The 11 rows, not having any commercial plant food, yielded 25 bushels at a cost of $6.00, while the addition of an 0-20-20 fertilizer on the rest of the field increased the yields to 36 bushels and the cost to $8.50. In other words, the boy made exactly $11.00 from an investment of $2.50. Only 125 pounds of fertilizer were used and this was placed directly in the row. A 10-foot chain was then dragged in each of the fertilized rows to mix the soil and commercial fertilizer.

Arthur Sigo

Farm experiments such as this one carried out by Arthur Sigo, not only serve to build up the faith of youthful farmers in the future of agriculture but are a distinct influence for improved methods of farming in a community. They are one of the brightest spots in the outlook for America's agricultural industry.

Bigger Beet Profits

By Rich Lucas

Mountain View, Missouri

ALL growers of sugar beets looking for bigger profits should base their hopes in greater tonnages. Luck will not bring extra profits. Bigger tonnages can only be secured by consistent attention to tried and proven methods, from the preparation of a seedbed on through the final harvesting.

A good seedbed is a prerequisite for

best returns. There is one and one time only that a good seedbed for beets can be made and this is before planting. Deep plowing, adequate discing, and smoothing will prepare a firm bed for the planter.

To grow and mature the maximum acreage tonnage of beets, plenty of available plant food is required to feed the crop from germination to maturity. For best profits, the plant food should be of proper balance to assist heavy growth, and as potash is a necessary requirement in helping to grow the beet, then later to transform the starch into sugar, a plentiful supply of this element in the fertilizer is strongly recommended. For many growers a 3-6-12 analysis is proving both practical and profitable. For the nitrogen content, I like sulphate of ammonia to start the seedlings. Superphosphate assists in forming the framework, while potash greatly helps to regulate the formation and quantity of sugar. However, it takes a combination of all three elements to produce the largest tonnage of the best beets.

Seeding time has been found a more important factor than many realize, the most desirable period being from the last week in April through the first week and a half in May.

After the beets have passed the thinning period, if a good stand has been secured with adequate fertilization given just before or at planting time, and with proper cultivation, Nature will do her part. Growers may then look forward to satisfactory pay checks as soon as the field tests show sugar content sufficiently high for delivery of the beets to the factory.

Convinced

By C. Hamilton

LaFontaine, Indiana

C. E. TROYER who has twice won the title of Corn King by his winnings at the International and has won seven gold medals in the five-acre corn club with yields of 100 bushels or more, had been convinced for years that fertilizer did not pay on his type of soil, especially for corn.

This soil was river bottom loam, good rich soil as far down as you wanted to dig. It was sandy and light, easily worked and full of plant food. Almost every year it was overflowed, adding still more plant food.

In addition to its natural resources, a rigid system of crop rotation had been carried on. It was planted to corn two years, then wheat or oats and either alfalfa or sweet clover, then corn again.

His theory was that always the limiting factor in his crop had been a lack of moisture. This sandy soil dried out easily in hot weather and there was seldom a year when there was enough rain to use all the plant food available.

He was induced last year to apply 150 pounds of 0-28-12 fertilizer to a plot. This was sown broadcast after the corn was planted. He watched this plot carefully all summer and could see not the least trace of difference in the fodder or size of ears.

About the first of October he shucked the fertilized corn and weighed it, and also the unfertilized which grew adjoining it, and found a difference of eight bushels to the acre in favor of the fertilized corn.

The main difference was in the quality of the corn. The ears were more mature, having less moisture and better keeping quality.

Crops Determine Dairymen's Profits

(*From Page* 24)

a few years ago when five grade cows were purchased by the University from different farmers who were in Herd Improvement Associations but were not feeding the cows properly. A very complete record was available in the Herd Improvement Association, as to the amount and value of their production and the feed cost, when these cows were purchased.

These cows were brought to the University and remained in the University herd until they had completed a lactation period. They were fed a ration consisting of alfalfa hay and silage, and a grain ration of four parts ground corn, two parts ground oats, and one part linseed oil meal. They were fed alfalfa hay and silage in amounts practically equal to what they would consume. The grain ration was fed in proportion to the milk produced. The same price for feed and milk was used in figuring the cost of feed and the value of the milk produced on the farm, as at Purdue.

The average production of these five cows on the farm was 5,063.8 pounds of milk and 202.9 pounds of butterfat. The average production of these cows when in the Purdue herd was 8,662.2 pounds of milk and 316.8 pounds of butterfat, an increase of 3,598.4 pounds of milk and 113.9 pounds of butterfat per cow when fed a good ration. The cows had an average return above feed costs of $57.40 more per cow in the Purdue herd than when on the farm.

Proper feeding of the dairy herd is one of the outstanding problems of the Indiana dairyman.

Montana

(*From Page* 12)

try has seen.

The headquarters of the Montana Agricultural Experiment Station staff are at Bozeman, in the famous Gallatin valley. Here the station has two large farms, one 320-acre farm under irrigation and another dry-land farm of 600 acres. Branch stations are established throughout the state, at Havre, Huntley, Moccasin, and Corvallis, the latter station being devoted to horticultural work. These substations, by their distribution, cover the different agricultural districts of this large state. The Montana State Grain Inspection Laboratory, located on the state college campus, is also under the direction of experiment station officials.

Many different lines of work in Montana have been delegated to the experiment station proper or to individual staff members. The station entomologist is also state entomologist and is in charge of work in western Montana looking to the eradication of the wood tick. Much of the work of insuring the standards of Montana crops and grains is handled by staff workers in the experiment station and extension service. In addition to his duties as director, Mr. Linfield during the past year has been acting president of the Montana State College, during the absence of President Atkinson, who has been in Europe on a year's leave.

The experiment station staff in

Bozeman has one of the largest and most modern buildings on the college campus—Agricultural Hall. There are also the grain laboratory, agricultural engineering building, veterinary science building, poultry building and plant, and the many barns and sheds of the station farm.

Corn

(*From Page 25*)

million acres. The balance of the corn acreage in the United States is distributed among all of the remaining states. Virtually all of the important corn states are in the Upper Mississippi Valley.

Of the corn grown in the United States over 83 per cent is ordinarily used for grain. On the northern edge of the corn belt, where dairying is important, considerable quantities are used for silage. In Wisconsin, where this type of use has probably gone furthest, in some years approximately one-half of the corn crop has been put into silos. For the United States as a whole, however, only between four and five per cent of the crop acreage is used for this purpose. The remainder is used in various ways, hogging down, corn cut green, fodder corn, and other purposes. Almost the entire crop in the United States is grown as a feed crop.

Of the world acreage the United States has about 55 per cent. There is no other region in the world that compares with the United States corn belt in corn production. Southern Europe, the area including Roumania, Jugoslavia, parts of Southern Russia, and other countries, represents the leading corn region of the Old World. In the Western Hemisphere, Mexico and the Argentine are the most important minor producing countries.

Many varieties of corn are grown. The so-called squaw corn, formerly grown by the Indians and to some extent by the early settlers in the United States, has virtually disappeared, and in its place are now grown the highly productive varieties of dent corn, which have been bred by the American Experimental Stations. The bulk of the corn production is now of these improved varieties.

Fertilize Potatoes

(*From Page 15*)

last fall. The buyers were not storing for speculation. They purchased only for immediate consumption. The reason for this unnecessary additional sluggish angle of the market was brought on by fear of the inevitable storage loss the buyers would face regardless of at what figure they bought. An extensive potato buyer told me early last November that whereas he had taken $50,000 worth of potatoes into his warehouse a year ago at this time, this season he had only $64 worth in his storage house.

The housewife and chef demand palatable sound potatoes, but the grocer is between them and the fulfillment of their wishes. Behind the grocer are many types of farmers.

When will all cooperate to make potatoes more popular, particularly when they are cheap? Recently the writer, after visiting a leading potato growing section and seeing thousands of potatoes pitted in the field for lack of demand and other thousands of bushels allowed to rot in the field, entered the dining room of the leading hotel of the marketing city. Potatoes were at the time quoted at 35c a hundred. Baked potatoes were at the same time listed on the menu at 10c apiece or at the rate of about $12 a bushel. Not through any spirit of beneficence but because of choice, I ordered baked potatoes. But alas! My serving was represented by two under-sized, wrinkled, and cold tubers. Upon opening the first I found an unappetizing, brown hollow core and when the jacket was removed from the other, an unsightly, discolored grey pulp was revealed. One has to be mighty hungry to enjoy blighted potatoes.

Hence, the most successful growers, buyers, and consumers are united in believing that on quality production rests the future success of the potato industry. To insure quality, necessitates a more general application of scientific methods of production, including the generous use of commercial fertilizer and thorough spraying of the crop. Marketing methods must also be improved. It entails extra cost to put carefully graded table stock in the hands of the consumer, but the latter will gladly pay for what he wants.

Freezing-up

(*From Page* 28)

freezes solidly, and this ice with the surrounding soil forms a continuous sheet. If the cold continues, ice crystals form immediately below the sheet and increase in length as in the first type. These crystals act upon the sheet of soil and ice above them in the same manner that an automobile jack acts upon your car.

The layer of soil is forced upward, and immediately beneath it, there is a space partially filled with the ice crystals. As in the first type of freezing, plants are carried along with the upward moving soil. As thawing occurs, the ice crystals melt and the upper layer of soil settles back to its original position, but the plants can not return because their roots hold them at the position to which they have been lifted.

Repeated freezing and thawing has the same action on plants as occurs when any object is raised with a jack, then blocked up at the point of greatest lift, and a second lift obtained by placing blocks beneath the jack. This type of heaving occurs oftenest in the spring when there is a great variation between day and night temperature.

In the work at Michigan State, one instance was noted where a sheet of concrete, which weighed 15 pounds and was placed on the soil surface, was raised three inches in one night by the upward thrust of the ice crystals. The exertion of such a force accounts for the damage done to both plants and pavements.

The greatest heaving occurs in wet soils and adequate drainage would reduce the damage to some extent, but it would be difficult to prevent heaving in the spring when most surface soils are saturated with water. A straw mulch which would reduce the rapidity of freezing in low soil areas would probably reduce the damage, but each farmer would have to deter-

mine if the saving made would pay for the labor of applying the mulch. The possibility of preventing damage to pavements appears to be more hopeful, as it is possible to drain the underlying soil and to prevent the accumulation of water beneath the pavement.

Father & Sons—Partners

(*From Page 29*)

farming near Baldwin, Georgia. Here I really found a father and his sons as partners in farming. It was indeed a pleasure to visit this congenial trio and hear them talk of their farming business.

I have never seen two boys more interested in the home farm than Ernest and Conrad. Probably the reason they are interested is because they are allowed to share in the profits from it and are given some consideration in its operation.

While Hinson and Sons are carrying on a well-balanced farming program, the most interesting part of their farm is the dairy business. Since October, 1924, they have developed a registered Jersey herd valued at $2,900 and are selling at present approximately $375 worth of milk per month.

While enrolled in a Vocational Agricultural Class in 1924, Conrad, with the aid of his father and brother, purchased four registered Jersey heifers and one bull for which they paid $740 as a start towards developing a dairy business. Very fortunately they bought good calves of splendid breeding. They selected Jerseys because this breed predominates in northeastern Georgia, and seems naturally adapted to local conditions.

Ernest and Conrad had saved approximately $275 from projects they had carried on as a part of their agricultural work. The remainder of the purchase price of the calves, about $500, was borrowed. Since that time the profits from the herd have more than paid the purchase price of the calves, and Hinson & Sons are well on the road to prosperity, which usually follows the dairy cow.

As the heifers came into milk, they were put on official test for milk and butterfat. One of their cows—Dames Molly's Aneta has produced enough milk and fat to be designated as a silver medal cow, and is the state leader in her class.

The Hinsons are now milking eight registered Jerseys and two grade cows. They have five registered Jersey heifers, four of which are their own breeding. The milk is being retailed in Baldwin and Cornelia, Georgia. Conrad is assuming the major part of the work in carrying on the dairying; Ernest, however, is giving as much of his time to the project as his school duties will allow.

A large part of the feed for the dairy cows is produced at home. In this way Hinson & Sons are saving quite a bit on their feed bill. Alfalfa which grows abundantly on the Hinson farm constitutes a large part of the feed for the cows. Only last year eight additional acres were planted to alfalfa.

When asked their future plans, Conrad replied, "We expect to keep only as many cows as our milk trade demands, and to keep only high class individuals and continue official testing."

As soon as Ernest finishes high school, he will carry on the dairying while Conrad spends at least two years at the Georgia State College of Agri-

culture. Then Conrad will operate the dairying while Ernest attends college; at least this is their plan at the present.

No doubt many boys would manifest more interest in the farm if they were given some consideration in its operation and were taken in as partners by their fathers.

Agriculture Today

(*From Page 19*)

in California, and is being grown also on hundreds of thousands of acres in the typical cotton regions of Texas, Oklahoma, and Arkansas. The breeding work on cotton is leading to important by-product results such as cotton community production where, through cooperative action, single varieties of selected and bred cottons are being handled by community effort so as to exclude the mixing of strains.

Approximately 4,000 plants a year are being brought into the United States in connection with the bureau's search for new food, feed, and fiber crops. Of especial interest just now are large collections of soybeans obtained by American plant explorers in the Orient. Other plants include wheat, barley, and mungbeans from northern Manchuria. Among them is a wild apricot which was found growing on the rocky Manchurian mountainsides otherwise barren of vegetation except for a few weeds and a little grass. The fruit is very small, dry, and mostly seed, but the tree is so hardy that it may possibly have use in developing an apricot for regions farther north than the apricot now fruits.

The collection includes a wild grape that grows rank all over the Manchurian mountains where it is a heavy yielder and is used largely for claret. Its hardiness makes it of potential value for the breeding of a hardy table grape for our more northern sections where grapes are not now being grown. A wild grapefruit, unlike anything ever before brought to the United States, may prove of value to citrus growers in breeding work. An exploration by airplane, canoe, and on foot in the tropical districts of Papua and New Guinea the past summer has yielded a collection of 167 varieties of sugar cane, to be used in tests and for interbreeding in the bureau's experimental plats devoted to the development of sugar cane varieties which are resistant to damage by mosaic and other diseases.

The use of gloves, blunt clippers, and special canvas sacks, to prevent bruising the fruit, have reduced harvest losses in the orange groves.

One variety of sugar cane in this collection is a hard, straight cane, growing to a height of nearly 33 feet. Cuttings of each variety obtained were shipped to the United States in refrigerated rooms of steamers for growth under observation in the bureau's sugar cane deten-

tion greenhouse at Arlington, Virginia. Duplicate cuttings have been planted at Sydney, Australia, as a precaution against possible loss or death of cuttings sent to the United States.

Liming Sour Soils

(*From Page 23*)

ference in the crop producing value of the three forms of lime. These data further emphasize the importance of lime in the rejuvenation of sour soils so abundant in our eastern states. Based on the average yields due to the three forms of lime, corn was increased 145 per cent, oats 56 per cent, wheat 127 per cent, and hay from weeds to 3,793 pounds per acre.

Within the last few years specially prepared blast furnace slag has been sold in several eastern states as a source of agricultural lime. This material is placed on the market at the present time in granular form prepared by running molten slag into cold water. The slag is broken down into small porous particles through the process of rapid cooling and becomes quite brittle. The lime is present in the form of calcium silicate equivalent to from 45 to 52 per cent lime oxide (CaO). This new form of agricultural lime is now being studied at the Snow Shoe experiment fields on DeKalb soil. The experiments are arranged in four tiers of 50 plots each. From one to five tons of slag per acre are compared with an application of one ton per acre of pulverized limestone. The following data shows the relative value of the two materials in the production of hay.

In the production of hay the heavier applications of slag have given yields comparable to those produced by one ton of limestone. In each case the four lime applications have given yields considerably in excess of the unlimed soil. The several applications of lime were applied in 1926. The above crops were harvested in 1928 except soybean hay which was produced in 1926.

A study of the above data serves to emphasize the importance of lime in our scheme of soil management as a means of paving the way for maximum return from the use of fertilizers. The several forms of basic lime when applied to the soil on the basis of equal units of lime oxides of similar fineness show the same value in crop production.

POUNDS PER ACRE

	Clover and Timothy	*Timothy*	*Soybeans*	*Kentucky Blue Grass*	*Sweet Clover*
No lime	*617	*651	3010	1599	0
One ton limestone	1666	1122	5651	2145	8041
One ton agr'l slag	617	834	4392	2096	165
Two tons agr'l. slag	1880	1105	4806	1711	4758
Three tons agr'l. slag	1855	1117	5636	2548	7712

*Weeds.

Fertilizers for Pecans

(*From Page 9*)

the high nitrogen mixture grew more rapidly than did those fertilized with the high potash or high phosphate fertilizer.

The relative effects of the three fertilizers on yields are somewhat different than on growth.

Potash Increases Yields

With each of the varieties the fertilizer mixture high in potash has given largest yields. With the Curtis the high potash mixture yielded 1,907 pounds of nuts per acre in the four years against 1,309 pounds for the unfertilized trees. With Schley, which is normally a low-yielding variety, the high potash mixture produced 644 pounds of nuts per acre in four years against 206 pounds for the no-fertilizer plot. The Stuart produced for the high potash fertilizer 488 pounds per acre in four years against 311 pounds for the no-fertilizer plot.

The fertilizer application was as follows:

1922, 400 pounds per acre
1923, 600 " " "
1924, 800 " " "
1925, 800 " " "

It is a matter of simple mathematics to determine whether or not fertilizer has been profitable in this orchard. The total amount of fertilizer applied per acre in the four years is 2,600 pounds. The approximate cost of the fertilizer giving best yield is $35 per ton or $45.50 for the total amount applied.

With the Curtis variety there was an increase in nuts, when the high potash mixture was used, of 598 pounds over the check. The volume of this increase at 30 cents per pound is $179.40 or a gain of $133.90 after deducting the cost of the fertilizer.

With the Schley variety there was a gain, when the high potash mixture was used, of 438 pounds of nuts over the check. The value of this increase at 55 cents per pound for this high-quality nut is $240.90 or a gain of $195.40 after deducting the cost of the fertilizer.

With the Stuart variety there was an increase of 177 pounds of nuts over the check. The value of this increase at 40 cents per pound is $70.80. When the cost of the fertilizer is deducted the gain is $25.30. In this orchard nitrogen has produced a vigorous tree growth, but potash is required for nut production. Both fertilizer elements are essential.

Potash Improves Quality

The pecans from fertilized trees in most of the experiments were slightly larger than those from the unfertilized ones. The mixtures high in nitrogen produced the larger and better filled nuts. The protein of the pecan meat was influenced very markedly by fertilizers. There was a difference of 3 to 4 per cent in protein content of pecan meat in nuts grown where fertilizers high in nitrogen were used over those grown without fertilizer or with fertilizers which were principally phosphate or principally potash.

Fertilizers have an influence on the fat or oil content of the kernel. By a laboratory examination of the nuts grown with different fertilizers on a number of soil types, it was found that potash has an appreciable influence in enriching the kernel in oil. Pecans grown where high potash fertilizers were used contained approximately 2 per cent more oil than nuts

from unfertilized trees. In all the experiments conducted, the color and plumpness of the kernel of the nuts were noted. While no comparative figures were secured it was apparent that potash produced a clearer meat having a lighter color than did phosphate or nitrogen. This factor was determined with several varieties, namely, Schley, Stuart, Alley, Success, and Frotcher, all of which showed a lighter colored meat when grown under high potash fertilization.

Fertilizer Mixtures

The fertilizer for the pecan orchard should contain all three of the fertilizer constituents, nitrogen, phosphoric acid, and potash. The ratios of these constituents depend on the character of the soil and the cultural system practiced. Phosphoric acid and nitrogen influence tree growth, and the yield, filling qualities, and size of the nut, and potash the fat content and color and plumpness of the kernel. On clay loam and sandy loam soils where leguminous cover crops are grown and turned under for manuring, thus supplying considerable nitrogen, fertilizers analyzing 4 to 5 per cent nitrogen, 8 to 10 per cent phosphoric acid, and 3 to 4 per cent potash have given good results on bearing trees. For soils of this type high in organic matter and nitrogen, a 4-10-3 mixture could be used with good results, but for most soils a mixture containing 5 per cent nitrogen is preferable. For young orchards from time of setting until they are 7 to 8 years old, it is advisable to fertilize with a mixture containing even more nitrogen. A mixture containing 6 per cent nitrogen, 8 per cent phosphoric acid, and 4 per cent potash has been used widely by nurserymen and orchard growers with success.

For light sandy soils of the Coastal Plain, mixtures containing 6 to 7 per cent potash should be used. In preparing a fertilizer mixture for pecans, consideration should be given to the material used. Superphosphate is used principally in mixed fertilizers and is the most available source of phosphorus. The potash materials do not seem to vary widely in their effects, the sulphate and muriate and manure salt being most widely used. The fertilizer mixture should contain several sources of nitrogen and should be derived partly from such quickly available materials as nitrate of soda, sulphate of ammonia, and synthetic nitrogen compounds and partly from slowly available sources, such as fish scrap, tankage, blood, or cottonseed meal.

A fertilizer containing approximately 5 per cent nitrogen, 10 per cent phosphoric acid, and 3 per cent potash can be prepared by mixing the materials in the following proportions:

Superphosphate (16% P_2O_5)	1,250 lbs.
Muriate or sulphate of potash (50% K_2O)	125 "
Nitrate of soda (15% N)	200 "
Sulphate of ammonia (19.5% N)	255 "
Organic materials as tankage, fish scrap, or dried blood (12% N)	170 "
Total	2,000 "

In such a mixture 1.5 per cent of nitrogen is derived from nitrate of soda, 2.5 per cent from sulphate of ammonia, 1.0 per cent from an organic material.

A 6-8-4 mixture suitable for young trees can be prepared as follows:

Superphosphate (16% P_2O_5)	1,000 lbs.
Muriate of sulphate of potash (50% K_2O)	160 "
Nitrate of soda (15% N)	270 "
Sulphate of ammonia (19.5% N)	210 "
Organic source as fish scrap, tankage or dried blood (11% N)	360 "
Total	2,000 "

The nitrogen in this fertilizer is de-

rived 2 per cent from nitrate of soda, 2 per cent from sulphate of ammonia, and 2 per cent from an organic material. Two-thirds of the nitrogen is from readily available sources and one-third is from organic substances which are more slowly available.

Fertilizer applications in commercial pecan orchards vary from a few pounds per tree to a couple of bags. This large amount was tried on the Gulf Coast in a favorite orchard of a pecan enthusiast, who declared it a profitable investment. The economical application will vary with the orchard, depending on orchard management. For orchards from 7 to 10 years old from 400 to 800 pounds per acre is a normal application. Older orchards require larger amounts.

Obligations

(*From Page* 4)

circumvent hard and unhealthy labor. The more we successfully invent means and methods to do our menial tasks, the more time we have again for education. This may have some semblance to a cycle process, but it is not a vicious one.

Good roads, better schools, and human sanitary safeguards probably represent the bulk of our public expansion at public expense. Save in a few outlandish backwaters, the tax payer who objects to these obligations is snowed under at the ballot box. The progress and prosperity shibboleth is victorious because it is at least *potential* and *positive*. Mankind likes to think in terms of hope and promise for the future. So he is willing to pay for his dreams.

Whenever somebody tries to find out if the obligations imposed upon some officer are being prudently met, the average citizen yawns and flutters his newspaper to read the latest persiflage.

We leave our public obligations to proxies for their solution, just as we often postpone our individual ones to that distant date when our ship comes in.

When we are on the receiving end of some other debtor's obligation, the test of character and strength is no less trying.

In private obligations the attitude of the "party of the first part" toward the "party of the second part" has undergone a decided outward change. Time and custom have changed his demeanor, not that the creditor is less anxious, but he is less crude in his anxiety.

The cringing debtor and the skinflint creditor have largely become obsolete. The wider use of credit by big business as well as little business, the progress of legislation and other factors have made this happen. "Save the Homestead of Uncle Josh" as portrayed in the melodramas of thirty years ago made cruelty, parsimony, and greed seem intolerable.

Duty and a decent respect for others have largely replaced fear and trickery in mercantile trade.

In all the field of obligations we must see that *principle* is above *principal* and that *human interest* is mightier than *compound interest*.

Once a month we settle the outstanding (and sometimes longstanding) obligations with a few splutters of ink and numerous inward sighs for self-denied objectives which have been thwarted by our real obligations.

But our bank account of good will,

kindness, cheerfulness, and sympathy cannot be drained by spending it. Given good health and a reasonable share of the world's opportunity, our spiritual and mental treasures actually increase every time we use them.

Parental obligations, neighborly obligations, and many business obligations cannot be plastered with the dollar sign.

When I wish you a Happy New Year, I am not thinking so much about the raise which your Chief owes you, but I am hoping for nicer things than that in store for you.

I am in fact congratulating you on the possession of a sympathetic wife and heedful children, and wishing you more pleasant hours of their companionship. I know that your wife married you for your personality, not your purse, and that your kids do not cease to be considerate after Christmas.

I know that your job is as dear to you for the joy as the jack there is in it. The misfits and misanthropes on any job have but one obligation to society, and that's to get a new job before it's too late. Anyone who lives only for the money in his work is just crouching in a haunted house waiting for the ghost to walk!

EMBROIDERED art mottoes that enjoined us to be upright and honest have disappeared from the household along with the framed coffin plates and other parlor horrors. The copy-book precepts and platitudes have been laid aside by wise school ma'ams. Sensible firms do not lay claim to the only original supply of fair dealing any longer.

Obligations have become something of every-day vitality in our humdrum lives, so that we often perform them without patting ourselves on the shoulder blades.

The world has come into a positive atmosphere where "do" is recognized and "don't" is penalized.

The old-time revivalists of my boyhood used to have old reformed reprobates on the mourner's bench to clinch their red hot arguments on the temperature of Hades. The modern reformer organizes boy scouts out of boy slouches and does a little flood control engineering at the headwaters of life's swift current. We should be teaching youth to face obligations, not avoid them.

Actual obligations have been partly sidetracked in these hectic days for *fancied* obligations.

"Keeping up with the Joneses" is too often a besetting idiosyncrasy of life in this sophisticated era. Whether it is a sin or not depends upon how much you neglect the real for the imaginary obligations.

One of my business friends remarks cynically that "no one wants anyone else to have more than he has, unless it be debts or diabetes."

He goes on further and accuses our manufacturers and salesmen of practicing what he terms "progressive obsolescence" or the nifty art of making new models popular before the old ones are paid for. He claims this tickles the palate of all our kindred who follow the fetish of newest notions, regardless of bread, butter, or budgets.

The wife who does not envy the expensive fur coat of her husband's stenographer is like unto the wise women of old Israel—we should rise up and call her blessed. Her friends call her a frump! Rare indeed is the family which has not fallen victim to the lure of social competition. The watchful eyes of petty jealousy creates misery in the midst of plenty.

The get-rich-quick mania is either the best or the worst among our fancied obligations. It all hinges upon what kind of stock you buy, from whom you buy, and how, and when, and where.

It was only last month that many felt obliged to pit their luck and margins against the wily turns of the paper profit wheel of fortune, only to

come away with their pockets turned wrong side out. In their chase to the end of the rainbow of fancied obligations, they found themselves unable to meet the coal man face to face. Those who escaped the squeeze imagine themselves preferred, while the unlucky ones feel pretty common. Hazard taking is always a self-imposed, needless obligation, but they tell me that the thrill is worth the spill.

What a list of obligations face us on our way. The real ones and the illusions, mingled together in a crazy pattern hard to distinguish or identify! Happy were the owners of log cabins, corn cob pipes, hound dogs, and fiddles back when the West was young.

Tales of our grandsires, simplicity and content; hoping for little and getting less; living in robust kinship with the skunks and the stars, the hoppers and the clouds; dreaming away on land that later gave painful birth to skyscrapers, subways, and sinecures. Their obligations were as scarce, but their resolutions became the realities of the present which we now enjoy and speculate upon.

Having but a few thoughts to think and a few tasks to do, they did them well. Antique furniture hunters will tell you that. They were at least *obliged* to be *resolute*, and keeping that fixed idea uppermost as the necessity of existence, they came through life with less complexity and confusion. Resolutions are easy to make and keep for the resolute, and obligations are simple when one has few things to be "much obliged" about.

The only time I do not feel sorry for the inmates of our poor farm is when I have a grist of modern pressing obligations to fulfill. At such times I yearn for a seat on the shady lawn next to the fat maniac who thinks he is Napoleon. But even he is trying to return from Elba, and so there is no peace for me anywhere!

Finally, here's to 1929 and our aspiring resolutions! But don't assume too many, for each one will turn out to be an obligation.

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FAMOUS SAYINGS OF EVERY-DAY WOMEN

"I've had plenty of chances to go on the stage but my folks won't let me."

"You'll eat your spinach or you won't get a bit of dessert."

"I'll have to have a little extra money this week."

"Anyhow, I notice her hair is dark at the roots."

"You must promise not to tell another soul."

"I'd do anything to lose a few pounds."

"You don't know the half of it."

"When did you shave last?"

"My feet are killing me."

"Mind your own business."

"Don't forget to write."

"Wipe off your feet."

"Now you stop."

"Darn it."

"Huh?"

—*C. A. Leedy, in Youngstown Telegram.*

A REAL HEN

As the old lady strolled through the park, two urchins confronted her. "I say, lady," said the taller of the two, "my brother does fine imitations. Give him a penny and he'll imitate a hen."

"Dear, dear," smiled the old lady, "and what will he do—will he cackle?"

"No," replied the lad with a look of contempt. "He won't do no cheap imitashings o' that sort, he'll eat a worm."

NO TIME FOR TRIFLING

"Gimme twenty-two twenty-two," said the perspiring gentleman in the telephone booth.

"Two two two two?" repeated the voice with the smile.

"Now see here, young lady," came back the exasperated one, "you just get me my number and you and me will play choo-choo some other time."

"Low bridge," shouted the bus conductor. "Everybody keep his seat and face to the front."

A gay little flapper up forward turned around, smiled sweetly, and said, "My dear, you know that can't be done."

Love makes the world go round. But for that matter, so does a good swallow of tobacco juice.—*Yellow Crab.*

PARTNERS NOW

A Chicago man the other day took an extra big drink of corn whiskey, and shortly began to see reptiles, also animals in assorted colors. So he rented a room and opened a museum. Many people paid 35 cents admission and when they saw only an empty room they called a policeman. The policeman was going to arrest him, but the man got him off in a corner and gave him a drink. The policeman then gave the man $300 for a half interest in the show.—*Wroe's Writings.*

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